# *Respiratory & Hematopoietic Systems Module*

## *Clickers PQs*

| LECTURES TITLE | Page # |
|---|---|
| LECTURE 01: PULMONARY PATHOLOGY 1 | 1 |
| LECTURE 02: RESPIRATORY SYSTEM | 2 |
| LECTURE 03: PULMONARY PATHOLOGY 2 | 3 |
| LECTURE 04: HEAD, EYES, EARS, NOSE & THROAT (HEENT) | 4 |
| LECTURE 05: PULMONARY PATHOLOGY 3 | 5 |
| LECTURE 06: RESPIRATORY PHARMACOLOGY | 6 |
| LECTURE 07: PULMONARY PATHOLOGY 4 | 7 |
| LECTURE 08: RESPIRATORY TRACT INFECTIONS 1 | 8 |
| LECTURE 09: PULMONARY PATHOLOGY 5 | 9 |
| LECTURE 10: RESPIRATORY INFECTIONS 2 | 10 |
| LECTURE 11: PULMONARY PATHOLOGY 6 | 11 |
| LECTURE 12: RESPIRATORY TRACT INFECTIONS 3 | 12 |
| LECTURE 13: RED BLOOD CELL DISORDERS 1 | 13 |
| LECTURE 14: RESPIRATORY TRACT INFECTIONS 4 | 14 |
| LECTURE 15: RED BLOOD CELL DISORDERS 2 | 15 |
| LECTURE 16: RESPIRATORY TRACT INFECTIONS 5 | 16 |
| LECTURE 17: RED BLOOD CELL DISORDERS 3 | 17 |
| LECTURE 18: RESPIRATORY TRACT INFECTIONS 6 | 18 |
| LECTURE 19: WHITE BLOOD CELL DISORDERS 1 | 19 |
| LECTURE 20: RESPIRATORY TRACT INFECTIONS 7 | 20 |
| LECTURE 21: WHITE BLOOD CELL DISORDERS 2 | 21 |
| LECTURE 22: ANTIMYCOBACTERIAL DRUGS | 22 |
| LECTURE 23: WHITE BLOOD CELL DISORDERS 3 | 23 |
| LECTURE 24: ANTICANCER DRUGS 1 | 24 |
| LECTURE 25: WHITE BLOOD CELL DISORDERS 4 | 25 |
| LECTURE 26: RESPIRATORY TRACT INFECTIONS 8 | 26 |
| LECTURE 27: RESPIRATORY TRACT INFECTIONS 9 | 27 |
| LECTURE 28: ANTICANCER DRUGS 2 | 28 |
| LECTURE 29: BLOOD & LYMPHATICS INFECTIONS 2 | 29 |
| LECTURE 30: ANTICANCER DRUGS 3 | 30 |
| LECTURE 31: BLOOD & LYMPHATICS INFECTIONS 2 | 31 |
| LECTURE 32: ANTIMALARIAL DRUGS | 32 |

# Lecture 01: Pulmonary Pathology 1

A 1-day old newborn girl is brought to the NICU because of severe breathlessness. She was born at the 30th week of gestation. A deficiency in surfactant production is suspected & a diagnosis of neonatal atelectasis is made. Which of the following cells produce surfactant?

A. Type 1 pneumocytes
B. Type 2 pneumocytes
C. Capillary endothelial cells
D. Goblet cells
E. Alveolar macrophages

A 56-year-old man comes to the physician because of a 1-week history of cough productive of blood-tinged sputum. He has smoked 1 pack of cigarettes per day for the past 30 years. Physical examination shows finger clubbing. An X-Ray of the chest shows a hilar opacity. Bronchogenic carcinoma is suspected. Which of the following investigations would be most helpful in confirming the diagnosis of this lung cancer?

A. Sputum analysis
B. Lung biopsy
C. Pleural tap
D. Bronchography
E. Pulmonary function test

A 13-year-old boy is brought to the physician because of a 2-hour history of cough, tightness in the chest & shortness of breath. He has had similar episodes in the past & has a family history of allergies. Physical examination shows wheezing during expiration. Pulmonary function test shows a reduced Forced Vital Capacity (FVC). Which of the following best describes the value of FVC?

A. Volume of air exhaled with force following maximal inhalation
B. Volume of air exhaled during a 1-sec period
C. Volume of air inhaled or exhaled during normal respiration
D. Volume of air remaining in the lungs after maximal exhalation
E. Total volume of air the lungs can hold

**Ans: (B.) Type 2 pneumocytes || (B.) Lung biopsy || (A.) Volume of air exhaled with force following maximal inhalation**

# Lecture 02: Respiratory System

A patient with low-grade fever & weight loss has poor excursion on right side of the chest with decreased fremitus, flatness to percussion & decreased breath sounds all on the right. The trachea is deviated to the left. Based on the likely diagnosis, what would we expect to see on a plain X-Ray of the chest?

A. Large unilateral hyper-lucency with no visible lung markings suggestive of a pneumothorax.

B. Blunting of costophrenic angle with large radio opaque are suggestive of large pleural effusion.

C. Localized consolidation suggestive of a segmental pneumonia.

D. Patchy areas of consolidation with loss of lung volume suggestive of atelectasis.

A 57-year-old man develops acute shortness of breath shortly after a 12-hour automobile ride. The patient consults his internist & findings on physical examination are normal except for tachypnea & tachycardia. An electrocardiogram reveals sinus tachycardia but is otherwise normal. What is the next best step to confirm diagnosis?

A. A definitive diagnosis can be made by history alone

B. Obtain a pulmonary function test

C. Obtain a D Dimer

D. Obtain a spiral CT scan of the chest

A 30-year-old male is admitted to the hospital after a car accident that resulted in a fracture of the right femur. The fracture is managed with traction. Three days later he becomes confused & tachypneic. A petechial rash is noted over the chest. Lungs are clear to auscultation. Arterial blood gases show PO2 of 50, PCO2 of 28 & pH of 7.49. The most likely diagnosis is:

A. Unilateral pulmonary edema

B. Hematoma of chest

C. Fat embolism

D. Pulmonary embolism

E. Early *Staphylococcus aureus* pneumonia

**Ans:**
**(B.) Blunting of costophrenic angle with large radio opaque are suggestive of large pleural effusion.**
**(D.) Obtain a spiral CT scan of the chest**
**(C.) Fat embolism**

# Lecture 03: Pulmonary Pathology 2

A 15-year-old boy was admitted to the emergency department following near-drowning in a lake. Two days later, he developed bluish discoloration of skin & severe breathlessness. Physical examination shows crackles over all the lung fields. Laboratory studies show severe hypoxemia, that is refractory to oxygen therapy. Chest X-Ray shows diffuse bilateral pulmonary infiltrates. Which of the following morphological changes would most likely be seen on biopsy from his lungs?

A. Free floating septae
B. Proliferation of type II cells
C. Interstitial fibrosis
D. Hyaline membranes
E. Bronchial mucus plugs

A 70-year-old man comes to the physician because of a 10-month history of worsening shortness of breath. He has smoked 1 pack of cigarettes per day for the last 30 years. Physical examination shows the man sitting in a forward hunched position with pursed lips while expiration. Chest examination shows barrel-shaped chest & hyperresonant percussion note over all lung fields. An X-Ray of the chest shows hyperinflated lungs with flattening of the diaphragm. Spirometry shows a decreased FEV1:FVC ratio. Which of the following mechanisms best explain the pathogenesis of this condition?

A. Imbalance of protease & anti-proteases
B. IgE-mediated mast cell degranulation
C. Virus-induced mucosal damage
D. Release of fibrogenic substance by macrophages
E. Ciliary dysfunction due to genetic mutation

A 40-year-old man comes to the physician because of a 3-month history of cough productive of mucoid sputum & shortness of breath. He had similar symptoms last year for 4 months. He has smoked 1 pack of cigarettes per day for the last 20 years. Physical examination shows presence of cyanosis. An X-Ray of the chest shows prominent vessels & cardiomegaly. Spirometry shows a decreased $FEV_1$:FVC. Which of the following mechanisms best explain the pathogenesis of this condition?

A. Irritant-induced submucosal gland hypertrophy & goblet cell metaplasia
B. IgE-mediated mast cell degranulation
C. Virus-induced mucosal damage
D. Release of fibrogenic substance by macrophages
E. Ciliary dysfunction due to genetic mutation

**Ans:**
**(D.) Hyaline membranes**
**(A.) Imbalance of protease & anti-protease**
**(A.) Irritant induced submucosal gland hypertrophy & goblet cell metaplasia**

## Lecture 04: Head, Eyes, Ears, Nose & Throat (HEENT)

A 28-year-old medical student comes to the ER complaining of a severe headache. Statistically, it is likely to be a secondary headache.

A. True
B. False

A college student presents with a sore throat, fever & fatigue for several days. You notice exudates on her enlarged tonsils. After careful lymphatic examination, you notice some scattered small, mobile lymph nodes just behind her sternocleidomastoid muscles bilaterally. What group of nodes are these?

A. Submandibular
B. Tonsillar
C. Occipital
D. Posterior cervical
E. Post Auricular

A 34-year-old woman presents to the physician's office for evaluation of an eyelid problem. She also complains of weight loss & sweatiness. On physical exam you see an anxious & fidgety woman who has a very prominent gaze with protuberant eyes. Based on this description, what is the most likely diagnosis?

A. Ptosis
B. Ectropion
C. Exophthalmos
D. Epicanthus

A 15-year-old high school sophomore presents to the emergency room with his mother for evaluation of an area of blood in the left eye. He denies trauma or injury but has been coughing forcefully with a recent cold. He denies visual disturbances, eye pain, or discharge from the eye. On physical examination, the pupils are equal, round & reactive to light, with a visual acuity of 20/20 in each eye & 20/20 bilaterally. There is a homogeneous, sharply demarcated area at the lateral aspect of the base of the left eye. The cornea is clear. Based on this description, what is the most likely diagnosis?

A. Conjunctivitis
B. Acute iritis
C. Corneal abrasion
D. Subconjunctival hemorrhage

**Ans: (B.) False || (D.) Posterior cervical || (C.) Exophthalmos || (D.) Subconjunctival hemorrhage**

# Lecture 05: Pulmonary Pathology 3

A 65-year-old man is brought to the physician because of a 5-month history of progressive shortness of breath which is exacerbated on exertion. He has smoked one pack of cigarettes daily for 20 years. His temperature is 36.0°C (96.8°F), pulse is 80/min, blood pressure is 145/80 mmHg & respirations are 20/min. Physical examination shows a barrel-shaped chest on inspection & hyperresonance on percussion. Which of the following parameter will most likely best represent the above condition?

A. Decreased residual lung volume

B. Increased $FEV_1$/FVC ratio

C. Decreased $FEV_1$/FVC ratio

D. Decreased total lung capacity

E. Decreased functional residual capacity

A 16-year-old boy comes to the physician because of shortness of breath. He has had similar episodes in the past & they resolve over several minutes without intervention. He was diagnosed with allergic rhinitis at the age of 12 & has a skin disease since childhood. Physical examination shows diminished breath sounds & wheeze bilaterally along with an eczematous rash over his right forearm. Spirometry shows increased lung volumes & decreased $FEV_1$:FVC ratio. Which of the following morphological features are most likely to be seen in the airways of this patient?

A. Free-floating septae in alveoli

B. Alveoli lined by hyaline membrane

C. Goblet cell metaplasia

D. Eosinophilic infiltration of mucosa

E. Fibrotic thickening of alveolar septa

A 60-year-old man comes to the physician because of a 15-month history of dry cough & worsening shortness of breath. He has no history of any allergies or exposure to asbestos, silica, coal dust & tobacco products. Physical examination shows presence of inspiratory crackles over all lung fields. Spirometry shows increased $FEV_1$:FVC ratio. Imaging studies show honeycomb appearance & diffuse reticular opacities in the lungs. Which of the following is the most likely complication of this condition?

A. Brain abscess

B. Cor pulmonale

C. Infertility

D. Dextrocardia

E. Chronic liver disease

**Ans: (C.) Decreased $FEV_1$/FVC ratio || (D.) Eosinophilic infiltration of mucosa || (B.) Cor pulmonale**

# Lecture 06: Respiratory Pharmacology

A 56-year-old woman comes to the physician because of a 4-week history of yellow plaques at her inner eyelids bilaterally. She has a family history of dyslipidemia. Physical examination shows bilateral xanthelasmas near the inner canthus of the eyelids. Laboratory studies show elevated total cholesterol & LDL cholesterol. She is prescribed a drug which inhibits 3-HMG-CoA reductase. Which of the following drugs was she prescribed?

A. Atorvastatin
B. Ezetimibe
C. Gemfibrozil
D. Cholestyramine
E. Cholestipol

A 46-year-old man comes to the emergency department because of a 1-hour history of shortness of breath & chest tightness. His respirations are 30/min, blood pressure is 132/86 mmHg, pulse is 92/min & oxygen saturation is 92%. Physical examination shows diffuse expiratory wheezes & prolonged expiratory phase. Which of the following drugs should be administered to this patient at this time?

A. Prednisone
B. Albuterol
C. Ipratropium
D. Salmeterol
E. Tiotropium

A 46-year-old man comes to the emergency department because of a 1-hour history of shortness of breath & chest tightness. His respirations are 30/min, blood pressure is 132/86 mmHg, pulse is 92/min & oxygen saturation is 92%. Physical examination shows diffuse expiratory wheezes & prolonged expiratory phase. He is nebulized with a beta-2 adrenergic agonist & a muscarinic antagonist but continues to experience symptoms. Which of the following drugs should be administered to this patient at this time?

A. Prednisone
B. Albuterol
C. Ipratropium
D. Salmeterol
E. Tiotropium

**Ans: (A.) Atorvastatin || (B.) Albuterol || (A.) Prednisone**

# Lecture 07: Pulmonary Pathology 4

A 72-year-old man comes to the physician because of a 10-month history of dry cough & worsening shortness of breath. Physical examination shows mid-inspiratory crackles over both the lower lung regions. An X-Ray of the chest shows bilateral interstitial markings over the basal lung fields. Histologic examination of a biopsy specimen obtained from the lung shows patchy interstitial fibrosis comprised of mature & young fibrotic tissues, with accentuation at the subpleural regions. Which of the following is the most likely diagnosis?

A. Emphysema
B. Non-atopic bronchial asthma
C. Acute respiratory distress syndrome
D. Usual interstitial pneumonia
E. Bronchiectasis

A 62-year-old man comes to the physician because of a 15-month history of progressively worsening shortness of breath & dry cough. He works in a sandblasting industry for the past 10 years. Physical examination shows inspiratory crackles over bilateral upper lung fields. A chest radiograph shows reticular opacities on both upper lung lobes & sheets of calcification in hilar lymph nodes. Spirometry shows markedly reduced $FEV_1$ & normal $FEV_1$:FVC ratio. Which of the following complications is this patient most susceptible to?

A. Mesothelioma
B. Chronic bronchitis
C. Pulmonary tuberculosis
D. Brain abscess
E. Systemic hypertension

A 40-year-old woman comes to the physician because of an 8-month history of recurrent low-grade fever with night sweats, dry cough & worsening shortness of breath. She has no history of smoking or allergies. Physical examination shows maculopapular skin lesions over neck & forearms & presence of inspiratory crackles over upper lung zones. An X-Ray of the chest shows reticular opacities over upper lung lobes & bilateral hilar lymphadenopathy. A lung biopsy specimen shows presence of non-caseating granulomas which are negative for acid-fast bacilli. Which of the following additional findings is most likely to be seen on serum analysis in this patient?

A. Presence of anti-nuclear antibodies
B. Increased levels of IgE antibodies
C. Increased levels of angiotensin convertase enzyme
D. Decreased levels of Vitamin D
E. Decreased levels of alpha-1 antitrypsin

**Ans: (D.) Usual interstitial pneumonia || (C.) Pulmonary tuberculosis || (C.) Increased levels of angiotensin convertase enzyme**

# Lecture 08: Respiratory Tract Infections 1

An 8-year-old child is brought to the physician by their parents because of a 3-day sore throat, runny nose & cough. Vital signs are within normal limits. Physical examination shows mild edema of nares, frontal sinus & oropharynx. Laboratory studies show presence of a Naked ss(+)RNA virus. Which of the following is a most likely feature of microenvironment of the upper respiratory tract?

A. Resident polymorphonuclear cells
B. Absence of endogenous microbiota
C. Mucosal secretion of IgA
D. Complex composition of strict pathogens
E. Direct interface of capillaries & pneumocytes

A 6-year-old boy is brought to the physician by his parents because of a 3-day history of runny nose, sore throat & mild fever. Physical examination shows clear nasal discharge & absence of lymphadenopathy. Laboratory studies show the presence of a viral agent belonging to the Baltimore Classification Group IV. Which of the following biological features is most likely associated with the causative agent?

A. Naked dsDNA
B. Naked ssDNA
C. Naked dsRNA
D. Naked ss(+)RNA
E. Enveloped ss(-)RNA

An 11-year-old boy is brought to the physician by his parents because of a 2-day history of stuffy nose, sneezing, scratchy throat & mild diarrhea. He recently returned from an overnight summer camp. His temperature is 38°C (100.4 °F). Physical examination shows erythema of the nasal mucosa with clear discharge & mild conjunctivitis. Laboratory studies show cytopathogenesis caused by Naked dsDNA virus. Which of the following underlying conditions most likely increases the severity of symptoms associated with this causal agent?

A. Obesity
B. Impetigo
C. Food allergies
D. Asthma
E. Missed vaccination

**Ans: (C.) Mucosal secretions of IgA || (D.) Naked ss(+)RNA || (D.) Asthma**

# Lecture 09: Pulmonary Pathology 5

A 50-year-old woman comes to the physician because of a 5-week history of dry cough & shortness of breath. Physical examination shows inspiratory crackles. X-Ray of the chest shows bilateral white opacities. Transbronchial lung biopsy shows polypoid plugs of loose connective tissue filling the bronchioles & surrounding alveoli; the adjacent lung tissue being unremarkable. Which of the following is the most likely diagnosis?

A. Nonspecific Interstitial pneumonia (NIP)
B. Cryptogenic Organizing pneumonia (COP)
C. Usual Interstitial Pneumonia (UIP)
D. Acute Interstitial Pneumonia
E. Bacterial Pneumonia

A 50-year-old retired miner comes to the physician because of a 2-year history of progressive dyspnea & cough. He has smoked 1 pack of cigarettes per day for the past 20 years. Spirometry shows an increased $FEV_1/FVC$ ratio. An X-Ray of the chest shows parenchymal infiltrates & bilaterally increased broncho-vascular pulmonary markings. Examination of a lung biopsy specimen shows the presence of golden brown, beaded rods with translucent center & interstitial fibrosis. Exposure to which of the following etiological factors is most likely involved in the pathogenesis of this condition?

A. Moldy Hay
B. Silica
C. Asbestos
D. Coal dust
E. Cotton fibers

A 24-year-old woman comes to the physician because of a 6-month history of chest pain, shortness breath on exertion & fatigue. Physical examination shows elevated jugular venous pressure. An X-Ray of the chest is unremarkable. Echocardiography shows right ventricular hypertrophy & right atrial dilatation. Right heart catheterization shows a mean pulmonary arterial pressure of 35 mmHg (N: 8-20 mmHg). Which of the following etiopathogenetic mechanisms is most likely involved in this patient's condition?

A. Alpha1 anti-trypsin deficiency
B. Polymorphisms in TGF-β gene
C. Mast cell degranulation
D. BMPR-2 gene mutation
E. Antibodies against type IV collagen

**Ans: (B.) Cryptogenic Organization pneumonia (COP) || (C.) Asbestos || (D.) BMPR-2 gene mutation**

## Lecture 10: Respiratory Infections 2

An 8-year-old girl is brought to the doctor by her parents because of a 2-day history of fever, runny nose, dry cough & pain upon swallowing. Her temperature is 40.1°C. Physical examination shows tender cervical lymphadenopathy & mild erythema of the oropharynx with no apparent exudate. Laboratory studies of her nasal discharges show a small naked ss(+)RNA virus. Which of the following prevention measures could have most likely reduced the risk of infection?

A. Routine vaccination
B. Thorough hand-washing
C. Heating food to 60° Celsius for 10 minutes
D. Avoid travel to an endemic area
E. Maintaining chlorination in pool

A 47-year-old woman is evaluated for acute onset of high fever. She is currently unconscious & is being treated in the ICU following a motor vehicle accident 3 days ago. She is intubated & is on ventilation support. Physical examination is suggestive of consolidation in the right middle lobe, indicating pneumonia. Laboratory studies of the lung aspirate show Gram-positive diplococci. Which of the following host defenses is most likely compromised, contributing to the development of the current infection?

A. Impaired mucociliary function
B. Suppression of CD8+ T cells
C. Excessive secretion of lysozyme
D. Asthma
E. Absence of Natural Killer Cells

An 18-year-old woman comes to the physician because of an 8-day history of fever & persistent pressure across the bridge of her nose & forehead. Her illness started as common cold 14-days ago but got progressively worse the last week. Her temperature is 39.5°C (103.1°F), heart rate is 118/min & blood pressure is 110/76 mmHg. Physical examination shows yellow-green tinted thick nasal discharge & bilateral frontal sinus tenderness. Laboratory studies of the nasopharyngeal swab show positive results for Gram-positive bacteria that are $\alpha$-hemolytic & optochin sensitive. Which of the following characteristics of the most likely causative agent contribute to persistent colonization on the mucosal epithelium?

A. Polysaccharide capsule
B. Pneumolysin
C. IgA Protease
D. Secrete A-B type toxin
E. Lipoteichoic acid

**Ans: (B.) Thorough hand-washing || (A.) Impaired mucociliary function || (C.) IgA Protease**

## Lecture 11: Pulmonary Pathology 6

A 25-year-old man comes to the physician because of a 2-month history of recurrent fever & cough productive of blood-tinged sputum. Physical examination shows bibasilar crackles. An X-Ray of the chest shows irregular opacities over lower lung lobes bilaterally. Serum analysis is positive for IgG antibodies targeted against alpha-3 chain of type IV collagen. Which of the following would be the most important associated condition in this patient?

A. Deep vein thrombosis
B. Glomerulonephritis
C. Splenic infarction
D. Small cell carcinoma of lung
E. Situs inversus

A 57-year-old man comes to the physician because of a 2-week history of cough productive of blood-tinged sputum. He has smoked 1 pack of cigarettes per day for the past 35 years. Physical examination shows no abnormalities. A chest X-Ray shows a large hilar mass. A biopsy from the mass shows keratin pearls. Which of the following is the most likely additional clinical finding associated with this condition?

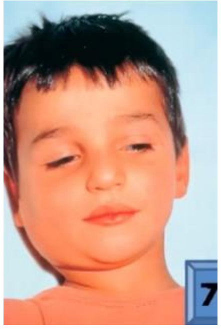
A. Hypercalcemia
B. Hypercortisolism
C. Myasthenia-like syndrome
D. Hyponatremia
E. Flushing

A 60-year-old man comes to the physician because of a 4-day history of cough productive of blood-tinged sputum. He has been smoking 1 pack of cigarettes per day for the past 40 years. Physical examination shows cervical lymph node enlargement. A chest X-Ray shows a large hilar mass. A biopsy from the mass shows small round cells with scant cytoplasm & hyperchromatic nuclei & areas of necrosis. Which of the following is the most likely diagnosis in this patient?

A. Small cell carcinoma
B. Large cell carcinoma
C. Adenocarcinoma
D. Squamous cell carcinoma
E. Carcinoid syndrome

**Ans: (B.) Glomerulonephritis || (A.) Hypercalcemia || (A.) Small cell carcinoma**

## Lecture 12: Respiratory Tract Infections 3



A 13-year-old boy is brought to the physician by his mother because of a 2-day history of mild fever, malaise & headache & a 1-day history of right facial swelling & pain. The pain has made eating & talking difficult. Physical examination shows tenderness of the parotid gland & swelling (shown in the image). Which of the following biological features is associated with the most likely causative agent?

A. ss(-)DNA
B. ss(-)RNA
C. Non-enveloped
D. Replication in host cell nucleus
E. Numerous serotypes

A 9-year-old girl is brought to the physician by her mother because of a 2-day history of fever, malaise & throat pain. The pain has become worse over the past day, making it difficult for her to eat. Prior to this, she was in good health. Temperature is 39°C (102.2°F). Physical examination shows erythematous posterior pharynx & palatine tonsils with white exudate. Which of the following is the most likely causative agent?

A. Adenovirus
B. *Corynebacterium diphtheriae*
C. Epstein-Barr Virus
D. *Staphylococcus aureus*
E. *Streptococcus pyogenes*

An 11-year-old girl is brought to the emergency department by her parents because of a 24-hour history of fever, drooling, pain with swallowing & difficulty breathing. Her vaccination status is unknown. Physical examination shows pooling of secretions & erythematous pharynx with exudate that is adherent to the mucosae. Which of the following biological features is associated with the most likely causative agent?

A. Anaerobic
B. Gram-negative rod
C. Motile
D. Produces an A-B toxin
E. Spore forming

A 9-year-old girl is brought to the physician by her mother because of a 2-day history of exertional shortness of breath & joint pain. Her mother recalls that she had a "scratchy throat" a few weeks ago. There is no history of prior medical conditions. Physical examination shows a new heart murmur of mitral regurgitation that was never heard on previous visits to the physician. Laboratory studies show the presence of diagnostic antibodies. Which of the following biological features is associated with the most likely causative agent?

A. Catalase Positive
B. Lactose Fermenter
C. Optochin sensitive
D. Oxidase Positive
E. β-Hemolytic

**Ans: (B.) ss(-)RNA || (E.) *Streptococcus pyogenes* || (D.) Produces an A-B toxin || (E.) β-Hemolytic**

# Lecture 13: Red Blood Cell Disorders 1

A 48-year-old female patient presents to her physician with recurrent attacks of asthma, allergic rhinitis & sinusitis. Physical examination shows palpable purpura on trunk, arms & legs. Chest X-Ray shows pulmonary infiltrates. Serology shows raised IgE levels & presence of p-ANCA/MPO-ANCA. Biopsy from a skin lesion shows necrotizing granulomas. A provisional diagnosis of a small vessel vasculitis is made. Complete blood count is expected to show raised count of which of the following cells?

A. Neutrophils
B. Lymphocytes
C. Monocytes
D. Eosinophils
E. Basophils

A 25-year-old pregnant female patient comes to her OBGYN for her first visit. She has a family history of a genetic disease affecting RBCs & wants to get herself tested for the same. A complete blood count is performed which reveals anemia & the peripheral smear shows an increased number of polychromatophilic cells. Which of the following best correlates with the peripheral smear finding?

A. Microcytosis
B. Macrocytosis
C. Hypochromia
D. Reticulocytosis
E. Low red cell distribution width (RDW)

A 20-year-old male patient presents with tiredness, malaise & mild splenomegaly. Family history reveals similar symptoms in other family members. Peripheral smear examination shows cells with loss of central pallor, with osmotically fragile cells. On further investigations, diagnosis of hemolytic anemia is made. Which of the following will provide evidence of compensatory erythropoiesis in this patient?

A. Unconjugated hyperbilirubinemia
B. Increased MCHC
C. Increased LDH
D. Decreased haptoglobin
E. Reticulocytosis

**Ans: (D.) Eosinophils || (D.) Reticulocytosis || (E.) Reticulocytosis**

## Lecture 14: Respiratory Tract Infections 4

An 11-year-old girl is brought to the emergency department by her parents because of a 2-day history of swelling of her face & dark urine. She had a sore throat 2-weeks ago for which they did not seek treatment. Temperature is 37°C (98.6°F), pulse is 92/min, respirations are 18/min & blood pressure is 150/98 mmHg (elevated). Physical examination shows bilateral pitting pedal edema. Laboratory studies of a urine sample show proteinuria & hematuria. Which of the following best describes the mechanism associated with these post-infectious sequelae?

A. Autoimmune antibodies binding to self-antigen
B. Accumulation of immune complexes in basement membrane
C. Rapid activation of pre-loaded mast cells
D. Delayed activation of memory T-helper cells
E. Soluble spread of A/B-type toxin to kidney

A 79-year-old man comes to the physician because of a 14-day history of persistent cough, headache, fever & tiredness. He received a diagnosis of chronic bronchitis 12 years prior. Physical examination shows notable exertion on inspiration. Laboratory studies show blood oxygen saturation of 91%. Infections with which of the following organisms is most commonly associated with triggering acute exacerbation episodes in persons with underlying lung conditions?

A. *Streptococcus pyogenes*
B. *Streptococcus pneumoniae*
C. *Corynebacterium diphtheriae*
D. Mumps
E. Rhinovirus

A 2-year-old male infant is brought to the emergency department by his mother because of a 2-day history of fever, worrisome cough & trouble breathing. He is up-to-date with all recommended vaccinations. The 7-year-old brother & the infant had a mild runny nose 4 days prior to the current status; however, the symptoms of the older brother have abated. His temperature is 38.2°C (100.8°F) & pulse is 185 bpm. Physical examination shows respiratory distress, including inspiratory stridor & barking cough. Which of the following features is expected to be present for the X-Ray?

A. Steeple sign
B. Thumb sign
C. Interstitial infiltrates
D. Lobar consolidation
E. Bronchiectasis

**Ans: (B.) Accumulation of immune complexes in basement membrane || (E.) Rhinovirus || (A.) Steeple sign**

## Lecture 15: Red Blood Cell Disorders 2

You are a first-year Internal Medicine resident. There are two patients in your ward with anemia & you have been asked to pathophysiologically classify them by ordering particular investigations. You ask for a complete blood count, lactate dehydrogenase, serum haptoglobin, reticulocyte count, serum iron & unconjugated (indirect) bilirubin. After obtaining the results, you diagnose hemolytic anemia in the first patient. **Decrease** in which of the following would have helped you make the diagnosis?

A. Unconjugated bilirubin
B. Haptoglobin
C. Lactate dehydrogenase
D. Reticulocyte count
E. Serum iron

A 45-year-old male pilot comes for a regular check-up with his physician. He reports a recent flight to a malaria-endemic region, for which he took prophylactic antimalarials. Two days later, he reports episodes of dark-colored urine, irritability & malaise. Peripheral smear examination shows bite cells, spherocytes & supravital stain shows dark spherical inclusions in the RBCs. Which of the following is the mechanism behind the patient's condition?

A. Defect in RBC membrane proteins
B. Defect in GPI anchored proteins
C. Mutation in beta-globin chains
D. Free radical damage to Hb
E. Mechanical damage to RBCs

An 8-year-old female patient with beta-thalassemia intermedia is brought to her pediatrician by her mother with a sudden onset of tiredness & tachycardia in the past one week. Laboratory investigations reveal a reticulocyte count of 0.2% & Hb 6.5 g/dL. Bone marrow examination shows erythroid precursors with parvovirus B19 inclusions. What is your diagnosis?

A. Post splenectomy infections with capsulated organisms
B. Aplastic crisis
C. Aplastic anemia (stem cell defect)
D. Vaso-occlusive crises
E. Complication of blood transfusion

**Ans: (B.) Haptoglobin || (D.) Free radical damage to Hb || (B.) Aplastic crisis**

## Lecture 16: Respiratory Tract Infections 5

A 3-month-old infant is brought to the emergency department by her parents because of a 2-day history of fever & noisy breathing. Her illness started 5-days ago as a runny nose. She was born prematurely at 31 weeks of gestation. Temperature is 38.3°C (101°F), heart rate is 165/min & respirations are 65/min. Physical examination shows the infant is in respiratory distress with nasal flaring, intercostal retractions & severe wheezes in all lung fields bilaterally. Laboratory studies show the presence of enveloped ss(-)RNA virus. Which of the following surface proteins most likely plays an essential role in host cell tropism for the viral causal agent?

A. Glycoprotein (G)
B. Polymerase (L)
C. Matrix protein (M)
D. Nucleoprotein (N)
E. Phosphoprotein (P)

A 12-year-old girl is brought to the physician by her mother because of a 2-day history of runny nose, dry cough & diarrhea. The parent reports that several members of their family have a cough & fever after a family gathering last week. Physical examination shows clear sputum & mild erythema of the nasal mucosa. Laboratory studies show a viral agent that is phylogenetically related to the SARS-CoV strain that caused a 2003 pandemic. Which of the following best characterizes the causal agent?

A. Naked dsDNA
B. Enveloped dsDNA
C. Naked ss(+)RNA
D. Enveloped ss(+)RNA
E. Enveloped ss(-)RNA

A 57-year-old woman is brought to the emergency department because of a 2-day history of cough, shortness of breath, diarrhea & fever with chills. She has chronic kidney disease & gets biweekly dialysis. Physical examination shows diffuse crackles & rhonchi in all lung fields. Chest X-Ray shows bilateral diffuse & focal alveolar space opacities suggesting extensive involvement of lung parenchyma. Laboratory tests of the sputum & nasopharyngeal samples show the presence of a virus that is novel to the human population. Which of the following symptoms is unique to this causative agent, in comparison to Common Cold or Flu?

A. Runny nose
B. Sore throat
C. Loss of smell or taste
D. Dry cough
E. Fever

**Ans: (A.) Glycoprotein (G) || (D.) Enveloped ss(+)RNA || (C.) Loss of smell or taste**

# Lecture 17: Red Blood Cell Disorders 3

A 56-year-old male patient presents to his physician with irritability, abdominal pain & jaundice. Peripheral smear shows normocytic normochromic RBCs & complete blood count reveals pancytopenia. Flow cytometry performed on RBCs is negative for CD 55 & CD 59. Which of the following is a potential complication of this condition?

A. Acute myeloid leukemia
B. Aplastic crisis
C. Hemosiderosis
D. Vaso-occlusive crisis
E. Autosplenectomy

A 45-year-old male patient with a long-standing history of alcoholism presents with symptoms of anemia, paraparesis, beefy tongue & lower limb paresthesia since 4 weeks. Laboratory investigations report MCV of 120 fL, with elevated serum homocysteine & methyl malonate levels. Peripheral smear shows macrocytes with neutrophils containing 7-8 lobes. Bone marrow examination shows pancytopenia with evidence of ineffective hematopoiesis. Which of the following will be seen in this patient?

A. Normal bilirubin levels
B. Low reticulocyte count
C. Normal red cell distribution width
D. Hypocellular bone marrow
E. Normal megakaryocytes

A 38-year-old female patient with a history of Crohn's disease (a type of inflammatory bowel disease) presents with symptoms of anemia. Investigations reveal microcytic hypochromic anemia. During a discussion with his residents, he mentions that this anemia could be due to iron deficiency following malabsorption in the intestine or due to long-standing systemic inflammation in Crohn's disease. You are the first resident he sees (lucky day!) & asks you to order a panel of tests to distinguish between the two possibilities. Which of the following tests would be the best way to differentiate between the two?

A. Serum iron
B. Red cell distribution width
C. Bone marrow stained with Prussian blue stain
D. Transferrin saturation
E. Total iron binding capacity

**Ans: (A.) Acute myeloid leukemia || (B.) Low reticulocyte count || (C.) Bone marrow stained with Prussian blue stain**

## Lecture 18: Respiratory Tract infections 6

A 2-year-old girl is brought to the emergency department in October by her father because of a 3-day history of fever & difficulty breathing. Physical examination shows inspiratory stridor & harsh cough. X-Ray examination shows clear lung fields & narrowing of the trachea as Steeple Sign. Laboratory studies of her nasal washings show evidence of syncytia formation & *in vitro* hemagglutination with red blood cells. Which of the following etiological agents is the most likely cause of the infection?

A. Streptococcus pyogenes
B. Bordetella pertussis
C. Influenza virus
D. Respiratory Syncytial Virus
E. Parainfluenza Virus

A 3-year-old boy is brought to the emergency department by his father because of a 2-day history of fever, sore throat & pain with swallowing. The family recently immigrated from Ukraine & his immunizations are not up to date. Physical examination shows unilateral swelling of left side cervical lymph nodes & parotid gland. Laboratory studies of his nasal washings show an enveloped ss(-)RNA virus exhibiting syncytia formation. Which of the following is the most likely causative agent?

A. SARS-CoV2
B. Influenza
C. Mumps
D. Respiratory Syncytial Virus
E. Rhinovirus

A 61-year-old woman comes to the physician because of a 3-day history of high fever, chest pain & productive cough with reddish-brown sputum. Her chest pain worsens on coughing & deep breathing. Her temperature is 39.5°C (103.1°F), heart rate is 118/min, & blood pressure is 110/76 mmHg. Physical examination shows bronchial breath sound & increased vocal resonance in the right lower lobe. Laboratory studies show numerous encapsulated Gram-positive diplococci bacteria on the sputum analysis. Which of the following is the most likely lab finding of the bacterial culture?

A. α-hemolytic optochin sensitive
B. β-hemolytic, bacitracin sensitive
C. Produces a green pigment
D. Requires Factors X & V
E. Grows on tellurite based agar

**Ans: (E.) Parainfluenza Virus || (C.) Mumps || (A.) α-hemolytic, optochin sensitive**

# Lecture 19: White Blood Cell Disorders 1

A 35-year-old female patient presents with tiredness, irritability & photosensitivity since the past 2 months. She also complains of joint pain & swelling in the face, especially in the morning. Urine examination shows hematuria & massive proteinuria (~5 g/day). Renal biopsy shows features of membranoproliferative glomerulonephritis with immunofluorescence positive for IgG, IgM, C3 & C1q. Peripheral smear shows polychromasia with spherocytes & raised reticulocyte count. Which of the following investigation should be next to determine the cause of anemia?

A. Bone marrow examination
B. Coombs test
C. Osmotic fragility test
D. Hb electrophoresis
E. Flow cytometry

A 45-year-old male patient presents with pin-point hemorrhages on trunk & arms, tiredness & fever since the past 3 months. Chest X-Ray shows pulmonary infiltrates. Complete blood count shows reduced Hb, total leukocyte count & platelet count. Peripheral smear shows 24% atypical cells. Which of the following should be the next investigation?

A. Bone marrow examination
B. Differential leukocyte count
C. Lung biopsy
D. Platelet aggregation studies
E. Coombs test

Bone marrow examination is performed on the previous patient & around 45% atypical immature looking cells are found. What should be the next investigation to diagnose the nature of these atypical cells?

A. Polymerase chain reaction
B. Karyotype analysis
C. Fluorescent in situ hybridization (FISH)
D. Flow cytometry
E. Immunohistochemistry (IHC)

**Ans: (B.) Coombs test || (A.) Bone marrow examination || (D.) Flow cytometry**

## Lecture 20: Respiratory Tract infections 7

A 44-year-old patient presents to the emergency room with high fever, chest pain & purple-tinted thick productive sputum. His history includes substance & alcohol abuse & his listed address is a homeless shelter. His temperature is 41°C (104°F), pulse rate is 130/min, & blood pressure is 117/65 mmHg. The lab findings show purple mucoid *Klebsiella pneumonia* colonies on MacConkey plates from sputum cultures. Which of the following antibiotic resistance mechanisms is most likely associated with the causative agent that is of major concern for the medical community?

A. Alanine-Lactate residues at amino acid bridge of peptidoglycan
B. Carbapenamase
C. Penicillinase
D. Altered PBP
E. Lack of cell wall

A 21-year-old man comes to the physician because of a 10-day history of mild fever, dry cough & exertional shortness of breath. He also has headaches & malaise. He attends a public college in Northeast USA. There is no history of recent travel abroad. His temperature is 38.1°C (100.6°F), pulse is 90/min, respirations are 18/min & blood pressure is 110/70 mmHg. Physical exam shows erythema in the throat & vesicular breath sounds in all lung fields with some faint, scattered rhonchi. Cold agglutinin test is positive. Which of the following is the most likely diagnosis?

A. Croup
B. Bronchiolitis
C. Typical pneumonia
D. Atypical pneumonia
E. Pulmonary Tuberculosis

A 67-year-old man comes to the physician because of a 3-month history of cough, mild fever, night sweats & weight loss. His cough was initially dry & recently became productive with scant, blood-tinged sputum. He has been using intravenous cocaine for the past 15 years. Tuberculin skin test (PPD) shows an induration of 1.8 cm (18 mm) after 72 hours. Which of the following components is most likely responsible for the characteristic staining property of the causal agent of his current symptoms?

A. Hyaluronic acid capsule
B. Peptidoglycan
C. Mycolic acid
D. Slime layer
E. Lipoteichoic acid

**Ans: (B.) Carbapenamase || (D.) Atypical pneumonia || (C.) Mycolic acid**

# Lecture 21: White Blood Cell Disorders 2

A 21-year-old male patient presents with a 5-day history of malaise, sore throat & fever. Physical examination finds bilateral cervical lymphadenopathy. Examination of the peripheral blood reveals the presence of atypical lymphocytes with abundant cytoplasm & few azurophilic granules. Monospot test is positive. Which of the following CD markers would be positive if these atypical lymphocytes are tested on flow cytometry?

A. CD 4
B. CD 8
C. CD 19
D. CD 33
E. CD 34

A 21-year-old man presents with a 5-day history of malaise, sore throat, & fever. Physical examination finds bilateral cervical lymphadenopathy. Examination of the peripheral blood reveals the presence of atypical lymphocytes with abundant cytoplasm & few azurophilic granules which were found to be CD 8+ on flow cytometry. Monospot test is positive. A biopsy from a cervical lymph node is performed. Which of the following will be seen on the biopsy?

A. Diffuse effacement by lymphocytes
B. Follicular hyperplasia
C. Paracortical hyperplasia
D. Expansion of subcapsular sinus
E. Sinus histiocytosis

An 8-year-old boy is brought to his pediatrician with a jaw tumor which has been rapidly enlarging over the past 4 weeks. A biopsy from the tumor shows medium sized monotonous lymphocytes with numerous mitotic figures & apoptotic cells interspersed with macrophages. Immunohistochemistry shows positivity for CD 19, CD 10 & MYC & karyotype analysis shows t(8;14). Which organism is likely to be associated with this condition?

A. Human T cell leukemia virus
B. Helicobacter pylori
C. Human immunodeficiency virus
D. Epstein Barr virus
E. Human herpes virus 8

**Ans: (B.) CD 8 || (C.) Paracortical hyperplasia || (D.) Epstein Barr virus**

## Lecture 22: Antimycobacterial Drugs

A 40-year-old HIV-positive man comes to the physician because of pleuritic chest pain, hemoptysis & back pain for 2 months. He is diagnosed with bone tuberculosis & given appropriate treatment. Susceptibility testing shows resistance to isoniazid. Decreased activity of which of the following enzymes is most likely to be the cause of the resistance seen in these bacteria?

A. Catalase-peroxidase
B. DNA-dependent RNA polymerase
C. Topoisomerase II
D. Acetyltransferase
E. Transpeptidase

A 42-year-old man comes to the physician due to worsening shortness of breath & nonproductive cough over the last 3 weeks. He also notes 2 months of fatigue, intermittent fever & decreased appetite. He lost 5kg (11lbs) during this period. He has a history of intravenous drug use & 25 packs/year of smoking. He was released from prison 4 months ago. T38C, BP 110/70 mmHg, P90 bpm, RR18 pm. Crackles are present throughout lung fields. Heart sounds are normal. Chest X-Ray as shown. What is the recommended management of this patient?

A. Rifampin, isoniazid, ethambutol & pyrazinamide
B. Clofazimine & dapsone
C. Rifampin & isoniazid
D. Codeine & N-acetylcysteine
E. Salbutamol, ipratropium bromide & prednisone

A 45-year-old woman comes to her physician because of worsening shortness of breath, cough & hemoptysis. She recently immigrated to the United States & recalls that her father, in her country of origin, has similar symptoms. A chest radiograph shows right upper lobe fibrosis & her sputum tests positive for acid-fast bacilli. A diagnosis of active pulmonary tuberculosis is made & she is begun on a regimen of isoniazid, rifampin, ethambutol & pyrazinamide. At a follow-up visit one month later she says that her symptoms have improved. Her sputum is now negative for acid-fast bacilli. What is the next best step in managing this patient?

A. Continue current treatment
B. Replace current regimen with second line anti-TB medications
C. Stop ethambutol & pyrazinamide & continue isoniazid & rifampin
D. Add glucocorticoids
E. Stop all anti-TB medications

**Ans: (A.) Catalase-peroxidase || (A.) Rifampin, isoniazid, ethambutol & pyrazinamide || (A.) Continue current treatment**

# Lecture 23: White Blood Cell Disorders 3

**Ans: (X.) || (X.) || (X.)**

# Lecture 24: Anticancer Drugs 1

**Ans: (X.) || (X.) || (X.)**

# Lecture 25: White Blood Cell Disorders 4

**Ans: (X.) || (X.) || (X.)**

# Lecture 26: Respiratory Tract Infections 8

**Ans: (X.) || (X.) || (X.)**

# Lecture 27: Respiratory Tract Infections 9

**Ans: (X.) || (X.) || (X.)**

# Lecture 28: Anticancer Drugs 2

**Ans: (X.) || (X.) || (X.)**

# Lecture 29: Blood & Lymphatics Infections 2

**Ans: (X.) || (X.) || (X.)**

# Lecture 30: Anticancer Drugs 3

**Ans: (X.) || (X.) || (X.)**

# Lecture 31: Blood & Lymphatics Infections 2

**Ans: (X.) || (X.) || (X.)**

# Lecture 32: Antimalarial Drugs

**Ans: (X.) || (X.) || (X.)**

socrative

Name ____________
Date ____________

# Aug 2022 RHS Exam Review Part 2

Score ____________

**1.** A 9-month-old baby girl is brought to the physician because of cough, red eyes, and rash. Her parents state that the rash started on her face and neck 2 days ago and spread to the trunk and extremities. Her temperature is 40.1C (104.2F), pulse is 117/min, respirations are 26/min, and blood pressure is 92/57 mmHg. On physical examination, the patient has purulent conjunctivitis, and rhinorrhea.  Which of the following findings would confirm the diagnosis of this patient?

Ⓐ Palmar Rash
Ⓑ Bluish-white spots in the buccal mucosa
Ⓒ Rash at multiple stages of healing
Ⓓ Enlarged tonsils
Ⓔ Pseudomembrane formation

**2.** A 31-year-old man with Hodgkin lymphoma comes to the emergency department because of chest pain for the past 2 days. He has been receiving chemotherapy for Hodgkin's lymphoma for the last month.  An ECG shows nonspecific changes. An echocardiogram shows  reduced LVEF. echocardiogram shows dilation of the left ventricle. A diagnosis of dilated cardiomyopathy is made. Which of the following is the mechanism of action of the drug that is causing this patient'e clinical picture?

Ⓐ Inhibition of microtubule depolymerization
Ⓑ inhibition of dihydrofolate reductase
Ⓒ inhibition of topoisomerase II
Ⓓ alkylation of DNA strands
Ⓔ Inhibition of microtubule polymerization

**3.** A 7-year-old boy is brought to the physician by his mother because of low-grade fevers and a cough lasting for 2 weeks. He has vomited several times after fits of coughing. He has no history of serious illness and has not received any routine childhood vaccinations. His temperature is 38.3°C (101°F). Physical examination shows erythema of the nasal and oral mucosa. While in the exam room, he has a long series of consecutive coughs, during which he appears diaphoretic. The coughing is followed by a loud inspiratory gasp. Laboratory studies show a leukocyte count of 16,300/mm3 (67% lymphocytes) and nasopharyngeal secretions show growth of pleomorphic gram negative bacteria. Which of the following most likely prevented her infection?

Ⓐ MMR

Ⓑ PRP conjugate

Ⓒ DTaP

Ⓓ Pneumococcal conjugate

**4.** An 11-year-old girl is brought to the physician because of a 2-month history of recurrent abdominal pain and fatigue. Physical examination shows conjunctival pallor and splenomegaly. Laboratory studies show hemoglobin 8 g/dL (N: 11.5 g/dL to 14.5 g/dL) and MCHC 42 % (N: 31% to 36%). Examination of a peripheral blood smear shows round to oval red blood cells without central pallor. Osmotic fragility test shows fragile RBCs. Which of the following best explains the pathogenesis of this condition?

Ⓐ Synthesis of abnormal β-globin chain

Ⓑ Defective RBC membrane protein

Ⓒ Excess synthesis of α-globin chains

Ⓓ Defective synthesis of heme

Ⓔ Decreased release of erythropoietin

**5.** A 26-year-old woman, gravida 2, para 1, at 26 weeks' gestation, comes to the emergency department because of pain and swelling in her right calf. Physical examination shows an increased circumference of the right calf. The leg is warm and tender on palpation. Dorsiflexion of the right foot elicits calf pain. An ultrasound of the right leg shows a noncompressible popliteal vein. Which of the following is the most appropriate pharmacotherapy for this patient's condition?

Ⓐ Aspirin

Ⓑ Clopidogrel

Ⓒ Heparin

Ⓓ Rivaroxaban

Ⓔ Alteplase

**6.** A 30-year-old man comes to the emergency department because of a 5-day history of productive cough. He has had associated fatigue, fever, and diarrhea. His temperature is 38°C (100.4°F), heart rate is 100 BPM, respiration rate is 20/min, and blood pressure is 120/80 mmHg. Physical examination shows the patient in mild respiratory distress with diffuse crackles bilaterally on lung auscultation. A metabolic panel is significant for hyponatremia. Chest X-ray shows diffuse interstitial infiltrates. A bronchoalveolar lavage is performed and Gram stain of an obtained sample does not show any organisms. Which of the following stains should be used on this sample to identify the causative pathogen?

Ⓐ India ink
Ⓑ Methenamine Silver
Ⓒ Ziehl-Neelsen
Ⓓ Periodic acid-Schiff
Ⓔ Giemsa

**7.** A 36-year-old woman is brought to the emergency department with sudden-onset right side weakness and speech difficulty. During the last 3 weeks, the patient has experienced progressive fatigue, malaise, and low-grade fevers. Despite the symptoms, she did not seek medical attention and did not take any medications. She had a dental extraction 5 weeks ago, which was uncomplicated. The patient has never previously been significantly ill or hospitalized. She works as a receptionist at a legal firm and has never traveled outside the United States. She does not use tobacco, alcohol, or illicit drugs. The patient is admitted to the hospital, but despite adequate resuscitative measures, she dies 2 hours later. Gross autopsy shows large, friable irregular masses attached to the atrial surface of a valve. Which of the following underlying conditions most likely predisposed this patient to developing these cardiac changes?

Ⓐ ASD
Ⓑ Coronary Artery Disease
Ⓒ Mitral Valve Prolapse
Ⓓ Hypertrophic Cardiomyopathy
Ⓔ Hypertension

**8.** A 45-year-old woman comes to the physician because of fatigue and irregular menstrual cycles for the past year. She also complains of recurrent sinus infections. During the past 6 months, she has had increased urinary frequency and swelling of her feet. She has also had difficulty lifting her 3-year-old niece for the past 3 weeks. She was recently diagnosed with depression. She works as a medical assistant. The patient has smoked one half-pack of cigarettes daily for 25 years and drinks four beers on the weekends. Her only medication is escitalopram. She is 160 cm (5 ft 3 in) tall and weighs 79 kg (175 lb); BMI is 31 kg/m2. She appears tired. Her temperature is 37.0°C (98.6°F), pulse is 80/min, respirations are 18/min, and blood pressure is 140/82 mm Hg. Physical examination shows neck obesity and an enlarged abdomen. CT scan shows an irregular hilar mass. Examination of the skin shows multiple bruises on her arms and legs. There is generalized weakness and atrophy of the proximal muscles. 1 mg overnight dexamethasone suppression test shows a serum cortisol of 167 nmol/L (N < 50) and a 24-hour urinary cortisol is 425 μg (N < 300 μg). Diagnosis of Cushing Syndrome is made. Which of the following best explains the pathogenesis of her physical examination?

Ⓐ Excessive production of serotonin

Ⓑ Production of PTHrP

Ⓒ Inappropriate production of ADH

Ⓓ Ectopic production of gonadotropins

Ⓔ Ectopic production of ACTH

**9.** A 38-year-old man comes to the physician because of a 2-month history of fever, night sweats and painless lumps on the left side of his neck. Physical examination shows non-tender cervical lymphadenopathy. A biopsy of an inflamed node shows a large cell with bilobed nuclei, prominent nucleolus and many surrounding lymphocytes. Flow cytometry shows positivity for CD30 and CD 15. Which of the following is the most likely diagnosis?

Ⓐ Burkitt's lymphoma

Ⓑ Small cell lymphoma

Ⓒ Adult T-cell leukemia

Ⓓ Hodgkin's lymphoma

Ⓔ Diffuse large B-cell lymphoma

**10.** An 11-year-old girl is brought to the physician by his mother because of a 2-day history of exertional shortness of breath. Physical examination reveals erythema and exudate in the oral mucosa Her mother recalls that she had a "scratchy throat" few weeks ago. There is no history of prior medical conditions. Which of the following non-suppurative sequela is most likely to be associated with her current infection?

Ⓐ Stroke

Ⓑ Meningitis

Ⓒ Nephritic Syndrome

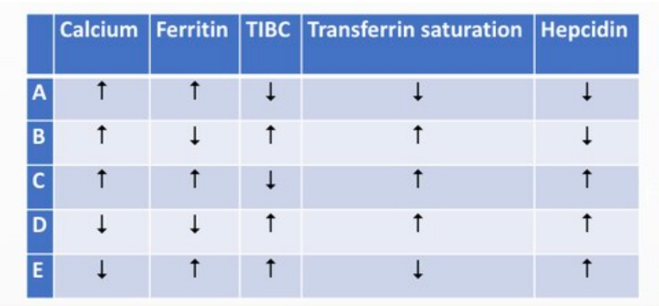
Ⓓ Scarlet fever

Ⓔ Erysipelas

**11.** A 25-year-old man comes to the physician because of a 5-week history of cough, fever, and night sweats. His temperature is 100.4 F. An Xray of the chest shows a right upper lobe infiltrate. A stained sputum specimen is positive for acid fast organism; sputum culture results are pending. He is diagnosed with active pulmonary tuberculosis and is started on the first line antituberculosis drugs. Which of the following drugs should also be prescribed to prevent the neurological toxicity associated with the patient's treatment?

Ⓐ Pyridoxine
Ⓑ Dapsone
Ⓒ Lecovorin
Ⓓ Pyrazinamide
Ⓔ Dexamethasone

**12.**



| | Calcium | Ferritin | TIBC | Transferrin saturation | Hepcidin |
|---|---|---|---|---|---|
| A | ↑ | ↑ | ↓ | ↓ | ↓ |
| B | ↑ | ↓ | ↑ | ↑ | ↓ |
| C | ↑ | ↑ | ↓ | ↑ | ↑ |
| D | ↓ | ↓ | ↑ | ↑ | ↑ |
| E | ↓ | ↑ | ↑ | ↓ | ↑ |

A 30-year-old African American woman comes to the physician because of the recent onset of blurred vision, facial droop and joint pain. She has a 6-month history of dyspnea at rest. She immigrated to the states when she was a child and denies any recent travel. She has never smoked and does not drink alcohol. Physical examination shows conjunctival pallor and tender erythematous nodules on both her shins. An CT of the chest shows bilateral hilar lymphadenopathy with diffuse interstitial infiltrates. Pulmonary function testing shows a reduced FEV1, a reduced FVC but a normal FEV1/FVC ratio. Laboratory studies show:
Hemoglobin: 9.0d/dL (12-16g/dL)
Hematocrit: 25% (36-46%)
Platelets: 250,000/mL (normal: 150,000-450,000/mL)
Sodium: 140mEq/L (136-145mEq/L)
Potassium: 4.0mEq/L (3.5-5.0mEq/L)
MCV: 70pg/cell (80-100pg/cell)
Which of the following additional results are most likely?

Ⓐ A
Ⓑ B
Ⓒ C
Ⓓ D
Ⓔ E

**13.** A 50-year-old man comes to the physician because of a chronic cough that has persisted for the past 15 months. Physical examination shows nasopharyngeal ulcers and diffuse crackles are heard in the lungs bilaterally. Laboratory studies show a creatinine concentration of 5.6 mg/dL, and urinalysis shows RBCs. His serologic titer for PR3-ANCA is elevated. A nasal biopsy is performed which shows mucosal and submucosal necrosis and necrotizing granulomatous inflammation. What is the most likely diagnosis?

Ⓐ Eosinophilic granulomatous with polyangitis

Ⓑ Goodpastures

Ⓒ Granulomatosis with polyangitis

Ⓓ Post strep glomerulonephritis

Ⓔ Diffuse proliferative glomerulonephritis

**14.** A 42-year-old man presents to the clinic with chronic shortness of breath, which has gotten progressively worse over the past years. He notes that he becomes short of breath even walking only a few blocks. The patient's social history is significant for smoking three cigarettes per day for the past 4 years. Physical examination demonstrates expiratory wheezing bilaterally, increased work of breathing, flattened diaphragm and a barrel chest. Serial pulmonary function tests reveal gradually increasing total lung capacity and residual volume. Which of the following predispose the patient to his current condition?

Ⓐ Hypertrophy of airway smooth muscle

Ⓑ Increase in the Reid index

Ⓒ Lobar consolidation

Ⓓ PAS positive granules in hepatocytes

Ⓔ Widening of the mediastinum

**15.** A 46-year-old woman comes to the physician for a 6-month history of worsening bronchial asthma control. Before this issue began, she only used her salbutamol inhaler once a day. Now, she has to use it multiple times daily and also reports frequent nighttime awakening. Seven months ago, she moved to an apartment that is damp and has mold on some of the walls. Which of the following is the mechanism of action of the first line drug that she was most likely prescribed?

Ⓐ Beta-2 receptor agonist

Ⓑ Beta-2 receptor blockade

Ⓒ Nuclear receptor binding

Ⓓ Prevention of mast cell degranulation

Ⓔ Phosphodiesterase Inhibitor

Ⓕ Muscuranic agonist

**16.** A 3-year-old girl is brought to the emergency department by her parents because of difficulty breathing for the past 5 hours. She has had a fever, sore throat and increased drooling for the past 24 hours. Her parents have denied all childhood vaccinations. On physical examination the patient is noted to be leaning forward with his neck hyperextended. Which of the following is characteristic of all serotypes of the most likely causal agent?

Ⓐ F Protein
Ⓑ Pseudomembrane formation
Ⓒ Elementary body formation
Ⓓ PRP Capsule
Ⓔ Catalase Positive
Ⓕ IgA Protease

**17.** On a snowy day in January, a 40-year-old woman presents to the physician with a sore throat, rhinitis, and cough. Her temperature is 100.4F (38C), pulse is 108/min, and blood pressure is 110/80 mmHg. He denies any gastrointestinal symptoms. Which of the following is associated with the causal agent? Vital signs are within normal limits and physical examination is unremarkable beyond mild pharyngeal erythema and inflamed nasal mucosa. PCR testing of a mucous swab sample shows an enveloped, positive sense single-stranded organism as the causative agent. Which of the following appropriately characterizes the identified organism?

Ⓐ Capsid fiber protein
Ⓑ VP1-VP4 Proteins
Ⓒ Synctia formation capabilities
Ⓓ Acid Labile
Ⓔ Capable of hemagglutination

**18.** A 45-year-old female presents to her general practitioner with complaints of chronic fatigue and mild weakness. She recently altered her diet to strictly vegetarian 3 months ago. The patient was diagnosed with Rheumatoid Arthritis five years ago that has been moderately well controlled with medication. Vital Signs are as follows
HR: 110 beats/minute
Blood Pressure 120/82
Temperature: 37 degrees
Respiratory Rate: 16/minute
Her physician decides to run a complete blood count and when the results return it is discovered that the patient has a Hypochromic Microcytic Anemia. Further, it is discovered the patient has low iron, low TIBC and increased ferritin. Which of the following is the most likely cause of this patient's symptoms?

Ⓐ Decreased dietary Iron intake
Ⓑ Beta Thalassemia
Ⓒ Anemia of Chronic Disease
Ⓓ Lead poisoning
Ⓔ Folate Deficiency

**19.** A 41-year-old produce manager presents to his local emergency room with acute confusion. He is alert and oriented to place but not to person or time. His vital signs are as follows:
BP: 102/62
HR: 114
Respiratory Rate: 25/minute
Temperature 39.8 degrees
A chest x-ray shows diffuse pulmonary interstitial infiltrates and the patient describes having continuous diarrhea for the past 5 hours. Lab serum studies show hyponatremia. The most likely offending agent would grow best on which of the following mediums?

Ⓐ Eaton Agar
Ⓑ Buffered Charcoal and yeast extract
Ⓒ Lowenstein Jensen
Ⓓ MacConkey Agar
Ⓔ Thayer-Martin Agar

**20.** A 63-year-old man comes to the physician because of fever for the past 4 days. He reports worsening fatigue and several severe flu-like illnesses over the past year, but he did not seek medical attention. Physical examination show dullness to percussion extending beyond the left inferior costal margin, and a complete blood count shows pancytopenia. Peripheral blood smear shows cells with extensive thin membranous processes, but a bone marrow aspiration fails to draw sufficient cells. Presence of which of the following would be most helpful in confirming this patient’s specific diagnosis?

Ⓐ t(11;14) on genomic analysis
Ⓑ CD5 surface markers in immunophenotyping
Ⓒ Lytic bone lesions on radiography
Ⓓ Lymphadenopathy on physical examination
Ⓔ Tartrate-resistant acid phosphatase histological stain

**21.** A 23-year-old woman comes to the physician for a follow-up examination. Her family emigrated from India when she graduated high school. She is now a medical student beginning her clinical training and requires medical clearance before starting work in the hospital. A purified protein derivative test shows a 12mm induration after 48 hours. Physical examination shows no abnormalities, and a chest radiograph shows clear lung fields. She is prescribed the first-line agent for her condition. 4 months later, a repeat test shows the same result. Which of the following is the most likely reason for treatment failure in this patient?

Ⓐ Decreased bacterial synthesis of mycolic acid
Ⓑ Mutation in a catalase-peroxidase
Ⓒ Cross-resistance with pyrazinamide and ethambutol
Ⓓ rpoB mutation
Ⓔ Inadequate penetration of granulomas

**22.** A 32-year-old pregnant woman at 10 weeks gestation comes to the emergency department because of a fever for the past 4 days. She initially thought that her illness had resolved quickly, but her fever returned 2 days later. She also reports vague headache and body pains. A peripheral blood smear shows trophozoites and granules within erythrocytes consistent with infection with *plasmodium vivax*. Which of the following is the most appropriate choice of treatment once the red blood cell phase has been cleared?

- Ⓐ Primaquine
- Ⓑ Doxycycline
- Ⓒ Chloroquine
- Ⓓ Quinidine
- Ⓔ Sulfadoxine

**23.** A 68-year-old man comes to the physician because of a 6-month history of progressive headache, dizziness, and weakness. Hot showers cause generalized pruritus. He had a normal routine health examination 5 years ago, at which point routine laboratory studies were also normal. His pulse is 90/min and blood pressure is 150/88 mm Hg. Physical examination shows facial plethora. Examination of the heart and lungs shows no abnormalities. The spleen is palpable 2 cm below the left costal margin. Genetic analysis shows a mutation in the *JAK2* gene. Which of the following sets of findings is most likely in this patient?

- Ⓐ Increased Hemoglobin, Increased EPO
- Ⓑ Decreased Hemoglobin, Increased EPO
- Ⓒ Decreased Hemoglobin, Decreased EPO
- Ⓓ Increased Hemoglobin, Decreased EPO

**24.** A 56 year-old male presents to his physician with complaints of chronic fatigue, palpitations, and dysphagia. He also describes a strange desire to consume ice. One physical examination the physician notes koilonychia and atrophic glossitis. The man’s vital signs are as follows:
Heart rate: 108 beats/min
Blood Pressure: 132/88 mmHg
Respiratory Rate: 16 breaths/min
Temperature: 37 degrees C

Which of the following clinical features is the man most likely to display?

- Ⓐ Macrocytic Anemia
- Ⓑ Cobalamin Deficiency
- Ⓒ Leukopenia
- Ⓓ Esophageal Webs
- Ⓔ Reduced Total Iron Binding Capacity

**25.** A 43-year-old man comes to the emergency department because of chills and recurring fevers of 39.4°C (103°F) for the past two days. He recently returned from a trip to Lesotho. Physical examination shows pallor. Peripheral blood smear shows intra-erythrocytic Schüffner'sdots. Which of the following is the most appropriate pharmacotherapy for this patient?

Ⓐ Clindamycin
Ⓑ Chloroquine
Ⓒ Ganciclovir
Ⓓ Mefloquine+ Primaquine
Ⓔ Artemisinins

**26.** A 48-year-old man comes to the physician because of a 3 week history of weakness, night swears, and low grade fever. He also has a 3 month history of painless swelling in the neck and groin. His temperature is 96 G, pulse is 80/min, and BP is 120/70 mmHG. PE shoes painless lymphadenopathy. Flow cytometry of the of peripheral lymph nodes show cells that are positive for CD 19, CD 20 and CD10. Evaluation shows a 14;18 translocation. This patient's condition is potentialy susceptible to transformation into which of the following conditions

Ⓐ AML
Ⓑ DLBCL
Ⓒ SLL
Ⓓ Polycythemia vera
Ⓔ Hodgkins Lymphoma

**27.** A 64-year-old man has a 90 pack year history of smoking. For the past 5 years, he has had a cough productive of copious amounts of mucoid sputum for over 3 months at a time. He has had episodes of pneumonia with Streptococcus pneumoniae and Klebsiella pneumoniae cultured. His last episode of pneumonia is complicated by septicemia and brain abscess and he dies. At autopsy, his bronchi microscopically demonstrate mucus gland hypertrophy. Which of the following is a possible chronic consequence of this condition?

Ⓐ Rectal Prolapse
Ⓑ Lung Cancer
Ⓒ Contraction Atelectasis
Ⓓ Right ventricular hypertrophy
Ⓔ Systemic HTN

**28.** A 68-year-old man comes to his physician’s office complaining of shortness of breath after performing physical activity. The patient's smoking history is 70 pack year in 40 years. He has had a 6-year history of episodic productive cough, which lasts up to 5 months at a time. Initially, the productive cough was odorless but over time, it became purulent and coupled with halitosis. A chest X-ray shows the presence of peripherally-extended airway markings. If a biopsy of the lungs were performed, thA 7-year-old girl is brought to the physician by her mother because of several bowel movements with foul-smelling stools that float over the past 3 weeks. She has a history of recurrent respiratory tract infections and has previously been diagnosed with an autosomal recessive disorder affecting the long arm of chromosome 7. Prior quantitative pilocarpine iontophoresis results have shown elevated sweat chloride levels. Physical examination today shows several soft, painless growths in her sinuses and mild finger clubbing. The most common cause of death in patients with her disorder is characterized by which of the following morphological features on biopsy?

Ⓐ Free floating alveolar septa in air spaces

Ⓑ Mucinous gland hypertrophy with a Reid index of > 0.5

Ⓒ Edematous, patchy epithelial necrosis with whorled mucous plugs

Ⓓ Acute and chronic inflammatory exudate within walls of dilated bronchioles

Ⓔ Edematous, pink fluid within alveoli with no inflammatory cells

**29.** A 17-year-old boy is brought to the emergency room by his father because of increasing shortness of breath and productive cough for the past 2 weeks. The patient has been brought in for 3 similar episodes in the past 6 months and has also been treated for acute pancreatitis during the past year. As a child he was found to have elevated levels of chloride when his sweat glands were stimulated with Pilocarpine and subsequently diagnosed with a genetic disorder affecting chromosome 7. Physical examination today shows nasal polyps and digital clubbing. Which of the following organisms is the most likely cause of this man’s recurrent respiratory infections?

Ⓐ Gram negative rod that produces H2S on TSI agar

Ⓑ Gram negative, fast lactose fermenting rod

Ⓒ Gram negative, oxidase positive rod

Ⓓ Gram positive, optochin sensitive cocci in chains

Ⓔ Gram positive, coagulase positive cocci in clusters

**30.** A 35-year-old woman with chronic obstructive pulmonary disease comes to the office for a follow-up appointment. The patient reports increasing shortness of breath that is not relieved by her inhalers. Her other medical conditions include osteoarthritis. She is a former smoker with a 45-pack-year history. Blood pressure is 120/70 mm Hg, pulse is 75/min, and respirations are 22/min. Oxygen saturation on room air is 91% at rest. On physical examination, jugular venous pressure is elevated. There is increased intensity of the pulmonic component of S2. Breath sounds are decreased bilaterally with scattered wheezes but no crackles. There is 2+ lower extremity edema.What is most likely the cause of her symptoms?

Ⓐ Excessive proliferation of smooth muscle cells
Ⓑ Non-necrotizing granulomatosis
Ⓒ Progressive bilateral interstitial fibrosis with no known cause
Ⓓ Hyperplasia of mucinous glands
Ⓔ Increased hypercoagulability and stasis of venous blood in lower limb deep veins

**31.** A 60-year-old woman is brought by her daughter to the emergency department because of a 2-day history of cough productive of purulent sputum. She feels sharp pain on inspiration in her right chest and has woken up “drenched in sweat” for the past two mornings. Her temperature is 40°C (104°F), heart rate is 110 BPM, respiration rate is 22/min and shallow, and blood pressure is 96/60 mmHg. Physical examination shows an acutely ill elderly woman in mild respiratory distress with dullness to percussion and increased egophony over the middle right lung lobe. Chest X-ray shows right middle lobar consolidation. The patient is admitted to the hospital and immediately started on moxifloxacin. Which of the following is a physiological characteristic of the most likely causative agent?

Ⓐ Ferments lactose
Ⓑ Optochin resistant
Ⓒ Catalase positive
Ⓓ Poly-D-glutamate protein capsule
Ⓔ Positive Quellung reaction in culture

**32.** A 7-year-old boy presents to his physician because of difficulty breathing, fever, and chills. He states that he also has a constant headache, and intermittent nausea, vomiting and diarrhea. From what family of viruses was he infected from and what is unique about this virus?

Ⓐ Enveloped (-) ssRNA, with linear formation: genetic drift
Ⓑ Enveloped (-) ssRNA with segmented formation; genetic shift
Ⓒ Non-enveloped dsRNA with segmented formation: genetic shift
Ⓓ Non-enveloped (+) ssRNA: Genetic drift.
Ⓔ Non-enveloped single stranded linear DNA virus; Genetic drift

**33.** A 45-year-old man comes to the physician because of a 3-week history of mild fever, paleness, anorexia, passing dark colored urine, difficulty breathing, fatigue and dry cough. He is a park ranger in the upper Midwestern USA and has not travelled outside the country. His temperature is 39°C (102°F), blood pressure is 108/55 mm Hg, pulse is 94/minute and respirations are 32/min. Laboratory results show hemoglobin 9.3g/dL, elevated prothrombin time, hyperbilirubinemia and elevated liver enzymes. A Giemsa stained thin smear of his blood shows intraerythrocytic ring-like parasites. Which of the following features is most likely associated with his symptoms?

Ⓐ Utilizes flagella for locomotion
Ⓑ Transmitted by mosquitoes
Ⓒ Causes periodic chills, fever and rigors
Ⓓ Reproduces exclusively by binary fission
Ⓔ Transmitted by ticks

**34.** A 22-year-old male university student comes to the physician because of easy fatigability of 2 months' duration. Physical examination shows mucosal gingival hemorrhages with no hepatosplenomegaly or lymphadenopathy. CBC shows hemoglobin, 9.5 g/dL; hematocrit, 28.2%; MCV, 94 μm3; platelet count, 20,000/mm3; and WBC count, 107,000/mm3. A bone marrow biopsy specimen shows hypercellularity with few residual normal hematopoietic cells. Most of the cells in the marrow are large, with nuclei having delicate chromatin and several nucleoli. The cytoplasm of these cells has azurophilic, peroxidase-positive granules. Which of the following is the most likely diagnosis?

Ⓐ Acute lymphoblastic leukemia
Ⓑ Acute myelogenous leukemia
Ⓒ Chronic lymphocytic leukemia
Ⓓ Chronic myelogenous leukemia
Ⓔ Hodgkin lymphoma

**35.** A 52-year-old woman comes to her physician because of persistent fever, night sweats and fatigue. She has a history of well-controlled type II diabetes mellitus. She is subsequently diagnosed with chronic myelogenous leukemia and begins the appropriate treatment for this malignancy. While undergoing treatment, she is brought to the emergency room by her daughter because of nasal discharge, headaches, right-sided swelling of her eye and cellulitis. A biopsy is taken of her nasal mucosa and light microscopy shows V-shaped, narrow, septate hyphae branching at 45-degree angles. Which of the following risk factors has most likely predisposed her to rhinosinusitis?

- Ⓐ Type II Diabetes Mellitus
- Ⓑ Living in the Southwestern USA
- Ⓒ Contact with pigeons
- Ⓓ Living in a nursing home
- Ⓔ Prolonged neutropenia

**36.** A 56-year-old man presents to the physician inguinal lymphadenopathy. He had been hiking in the Southwestern United States and sleeping in a log cabin a few days prior when he had noticed small rodent bites on his leg. Which of the following is most likely associated with the causal agent?

- Ⓐ Pyoverdin
- Ⓑ Causes an increase in capillary permeability
- Ⓒ F1 antigen
- Ⓓ IgA protease
- Ⓔ Isolated on Lowenstein-Jensen agar

**37.** 12. A 53-year-old woman comes to the office because of pelvic pain and postcoital bleeding. Speculum examination shows a friable, bleeding cervical lesion and a biopsy confirms the diagnosis of cervical cancer. She has radical hysterectomy and radiation. Following surgery the patient is treated with adjuvant therapy consisting of 4 cycles of paclitaxel. Other than alopecia, nausea and vomiting, which of the following additional adverse effects should the physician warn the patient about?

- Ⓐ Cardiotoxicity
- Ⓑ Hemorrhagic cystitis
- Ⓒ Peripheral neuropathy
- Ⓓ Nephrotoxicity
- Ⓔ Pulmonary fibrosis

**38.** A 32-year-old man comes to the emergency department because of a 4-day history of fever, myalgias, and cough. He lives in a rural area in New Mexico and owns an automobile repair shop. He recently cleaned his garage, which was infested with mice. He is tachypneic and must use accessory respiratory muscles to breathe. Fine crackles are heard on auscultation of the lungs . Which of the following is the most likely causal agent

Ⓐ Hanta Virus

Ⓑ Burkholderia Pseudomallei

Ⓒ Klebsiella

Ⓓ Coxiella

Ⓔ Haemophiles influenza

**39.** A 52-year-old man presents to his physician with headache, malaise, and a non-productive cough with an abrupt onset that has persisted for several days. Rales are auscultated bilaterally, and chest x-ray shows diffuse bilateral patchy infiltrates. Cytoplasmic inclusion bodies are seen on this patient’s bronchoalveolar lavage. The patient’s symptoms improve greatly following doxycycline treatment. Which of the following was the most likely source of the patient’s infection?

Ⓐ Mycoplasma pneumoniae

Ⓑ Pseudomonas aeruginosa

Ⓒ Legionella Pneumophilia

Ⓓ Chlamydia psittacine

Ⓔ Burkholderia pseudomallei

**40.** A 57-year-old man comes to the physician complaining of shortness of breath. He has a 20-pack year smoking history and his father died of heart disease at the age of 62. Chest X-ray shows an enlarged cardiac silhouette, substantial perihilar haze with peribronchial cuffing and a 2-cm coin lesion in the right upper lung lobe. Histological exam of a biopsy taken from the lesion shows nodules of hyaline cartilage separated by simple columnar epithelium. The histological findings of the biopsy are most consistent with which of the following diagnoses?

Ⓐ Oat-cell carcinoma

Ⓑ Metastatic adenocarcinoma of the colon

Ⓒ Squamous cell carcinoma

Ⓓ Pulmonary hamartoma

Ⓔ Bronchioloalveolar carcinoma

**41.** A 54-year-old previously healthy man comes to the clinic after 2 months of progressive, generalized weakness and easy fatigability. He also has abdominal discomfort and early satiety. The patient works as a security advisor and has not traveled recently. He is afebrile and other vitals signs are normal. On examination, he has pallor, abdominal distension, and massive splenomegaly with the spleen tip crossing the midline. No peripheral lymphadenopathy is present. Peripheral blood cell count shows pancytopenia. Bone marrow aspiration is attempted, but no marrow can be aspirated. Which of the following findings is most likely to be seen in this patient?

Ⓐ Myeloid cells with Auer Rods

Ⓑ Lymphocytes with Cytoplasmic Projections

Ⓒ Intraerthyrocytic ring form

Ⓓ Positive Heterophile antibody

Ⓔ Ringed Sideroblast

**42.** A 60-year-old man with a 40 pack-year history of smoking comes to the clinic due to 6 months of progressive difficulty breathing, fatigue, and weight loss. He has had an associated productive cough for the past month and says his sputum “turned red” yesterday. Respiratory rate is 27/min and oxygen saturation is 93% on room air; other vitals are within normal limits. Physical examination shows expiratory wheezes in the left lung and a chest X-ray shows enlargement of the left hilar lymph nodes along with a solitary pulmonary nodule measuring 4cm near the left main bronchus. Transbronchial biopsy of the mass shows diffuse sheets of small cells with stippled nuclei and high mitotic activity. Which of the following metabolic disturbances is most likely observed in this patient?

Ⓐ Hyponatremia

Ⓑ Hypercalcemia

Ⓒ Hyperkalemia

Ⓓ Hypoglycemia

Ⓔ Polycythemia

**43.** A 12-year-old boy is brought to the physician because of breathing difficulty. For the past 2 months, he has experienced recurrent episodes of wheezing and shortness of breath that are sometimes interrupted by coughing. These attacks tend to occur when he begins exercising or in cold weather, and have been resolving spontaneously after several hours. Earlier this year, he had an upper respiratory infection that lasted 2 weeks. He has no known allergies or family history of respiratory disease. Physical examination shows no abnormalities, and pulmonary function tests are within normal limits. Which of the following would most likely be seen on histological examination of a biopsy specimen from this patient's lung?

- Ⓐ Smooth muscle atrophy
- Ⓑ Calcified concentric spherules
- Ⓒ Alveolar septa destruction
- Ⓓ Eosinophilic crystals
- Ⓔ Diffuse lymphocytic infiltrate

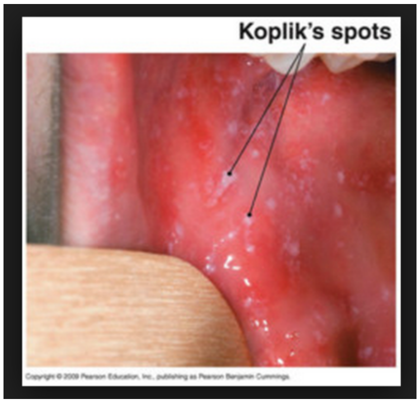
**44.** A 12-year-old boy is brought to the pediatrician by his mother for evaluation of easy bruising which she has noticed for the past two weeks. Physical examination shows multiple bruises of varying sizes on the trunk and arms. He also has had two upper respiratory tract infections in the past month. There is no lymphadenopathy or hepatosplenomegaly. Bone marrow biopsy shows a hypocellular bone marrow with fat cells. A complete blood count shows:
Hemoglobin: 8.2 g/L (N: 13.5-17.5 g/L)
Platelets: 80,000/mm3 (N: 150,000-400000/mm3)
WBCs: 2,100/mm3 (N: 4,500-11000/mm3)
Reticulocytes: <0.4% (N: 0.5-1.5%)
Which of the following is the most likely diagnosis?

- Ⓐ Myelofibrosis
- Ⓑ Acute lymphocytic leukemia
- Ⓒ Hairy cell leukemia
- Ⓓ Aplastic anemia
- Ⓔ Folic acid deficiency

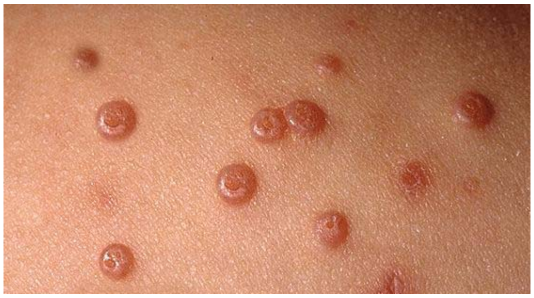
**45.** A 6-year-old boy is brought to the emergency room by his mother because of bleeding gums. For the past 2 days he has had shortness of breath and a fever. Physical examination shows mild hepatosplenomegaly, a single palmar crease, and a cardiac murmur with a fixed split S2 over the second left intercostal space. Flow cytometry is positive for CD10, CD19, and CD20. Laboratory studies show hypogammaglobinemia, neutropenia, and 32% lymphoblasts. What is the likely diagnosis?

Ⓐ Burkitt’s lymphoma
Ⓑ Chronic lymphocytic leukemia
Ⓒ Acute lymphocytic leukemia
Ⓓ Chronic myeloid leukemia
Ⓔ Hodgkin’s lymphoma

# Aug 2022 RHS Exam Review Part 2 Explanations



1. B
    a. Cough, Rhinorrhea (Coryza) and Conjunctivitis and RASH-⍰ MEASELS
        i. Organism
            1. Parayxovirus
                a. -ssRNA enveloped⍰ Group 5 baltimore classification
        ii. Risk fators
            1. Unvaccinated⍰ MMR vaccine protects against Measles, mumps, and rubella
        iii. Diagnostic Feature
            1. Koplik Spots "C"oplik ⍰ bluish grey buccal mucosal lesions with an erythematous ring
        iv. Other cumulative organisms/Conditions
            1. Erysipelas/Celliultus
            2. Ancycylostome Duodenales⍰ serpingous rash in the lower extremities, associated with walking barefoot on the beach
            3. Molluscum contangiosum⍰ umbilicated lesions



2. C
    a. We have a patient with dilated cardiomyopathy⍰ caused by doxorubicin or the daunorubicin (anthracyclines)
        i. MOA of anthracyclines
            1. Formation of ROS species
            2. Alters membrane fluidity
            3. Intercalates in the DNA
            4. Topoisomerase II inhibition
        ii. The dilated cardiomyopathy can be prevented by dexrazoxane
    b. Answer choices
        i. A⍰ Taxels
            1. AE: peripheral neuropathy and HSN reactions
                a. Prevent the HSN with dexamethasone or the H1 blockers
        ii. B⍰ Methotrexate
            1. Bone marrow rescue by adding Lecuvorin
        iii. D⍰ Cyclophosphamide or the Ifosfamide
            1. AE of Cyclophosphamide
                a. Hemorrhagic cystitis⍰ caused by acrolein
                    i. Prevented by mesna
            2. AE of Ifosfamide

                a. Hemorrhagic cystitis⍰ caused by acrolein
                    i. Prevented by mesna
                b. Neurotoxicity
                    i. Prevented by methylene blue or thiamine
                c. Fanconi Syndrome⍰ attack on the PCT
        iv. E⍰ Vinca Alkaloids
            1. Vincristine ⍰ Peripheral neuropathy and bone marrow suppression
            2. Vinblastine⍰ Bone marrow suppression
                a. Prevented/protected against by giving filgrastim
3. C
    a. Patient who is coughing until they vomit ⍰ Whooping cough
        i. Organism
            1. Bordetella Pertussis
                a. Gram Negative pleomorphic rod
        ii. Virulence Factors
            1. Filamentous hemagglutinin
            2. Pertussis Toxin
                a. ADP ribosylation of the Gi coupled protein receptor⍰ activation of the adenylate cyclase⍰ increase cAMP
        iii. Stages
            1. Cattaharal Stage
            2. Paraoxysmal Stage⍰ Coughing fit until you vomit
            3. Convalescent Stage
        iv. Prevented by the DTAp Vaccination
        v. Agars
            1. Bordet Genou agar
            2. Regan Lowe agar
4. B
    a. Osmotic fragility test is positive⍰ Spherocytes
    b. Two conditions present with spherocytes on PBS
        i. AIHA
            1. Normal MCHC
            2. Positive direct coombs tests
        ii. Hereditary spherocytosis
            1. Increased MCHC
            2. Negative direct/indirect coombs test
            3. Causes
                a. Autosomal dominant
                b. Mutation in spectrin, ankyrin, protein 4.2, or band 3
    c. Answer Choices
        i. A/C⍰ beta thalassemia
        ii. D⍰ Sickle cell anemia or HBC disease
        iii. E⍰ Chronic kidney disease or Polycythemia vera
5. H
    a. Preggos with a DVT⍰ Heparin

        i. MOA: anti-thrombin 3 activator/potentiator⍰ inhibitor of thrombin and factor 9
            1. AE: HIT (heparin induced thrombocytopenia)
                a. A decreased platelet count⍰ increased bleeding time
                b. Treat, you have to stop heparin immediately and give protamine sulfate
            2. Monitor the effects of heparin with aPTT
        ii. NEVER GIVE WARFARIN to preggos
            1. MOA: inhibitor the VKOR enzyme⍰ decreased activation of factors 2, 7, 9, 10, protein C and Protein S
            2. Monitor the effects of warfarin with PT/INR
            3. AE:
                a. Cutaneous necrosis⍰ caused by the loss of protein C
                    i. Prevent by giving the heparin bridge

6. B
    a. Chest X-ray shows a diffuse interstitial infiltrate⍰ pneumonia
    b. Which pneumonia presents with a hyponatremia⍰ Legionella
    c. The organism that is causing the pneumonia does not gram stain
        i. Legionella⍰ silver stain
        ii. Mycoplasma pneumonia⍰ no cell wall
        iii. Chlamydia psittaci⍰ obligate intracellular
    d. Legionella
        i. Organism
            1. Gram negative rod (weakly gram stains) but visualized with tehe silver stain
        ii. Presentation
            1. Hyponatremia
            2. Pneumonia
            3. Diarrhea
            4. Confusion/CNS symptoms
        iii. Agar
            1. BCYE agar
    e. Answer choices
        i. A⍰ Cryptococcus neoformans
        ii. C⍰ Mycobacterial organisms
        iii. D⍰ A1AT causing the hepatocytes to stain PAS positive, Acute lymphocytic leukemia
        iv. E⍰ Malaria, babesiosis, filariasis

7. C
    a. Friable mass on the surface of the atrial surface of mitral valve ⍰ infective endocarditis
        i. She also had dental extraction 5 weeks ago ⍰ Strep Viridans ⍰ subacute endocarditis
            1. Gram positive cocci, alpha hemolytic, catalase negative, coagulase negative
            2. Subacute endocarditis⍰ the valve had to be damaged before!!!

        a. Mitral stenosis
        b. Mitral regurgitation
        c. Mitral valve prolapse
    b. Paradoxical embolus⍰ embolus that originated on the right side of the body (venous side of the body) and ended up causing a stroke aka a DVT that dislodges and causes a stroke
        i. DVT⍰ travels up the venous system⍰ to the RA⍰ travel through the ASD (atrial septal defect)⍰ makes its way into the LA⍰ LV⍰ aorta⍰ common carotid artery⍰ up to brain⍰ stroke
    c. Late onset prosthetic valve endocarditis
        i. The patient got the valve more than 1 year ago
    d. Early onset prosthetic valve endocarditis
        i. The patient got the valve less than 1 year ago

8. H
    a. Cushing syndrome⍰ increased cortisol and proximal muscle weakness in the presence of a lung mass
    b. The patient most has likely has small cell carcinoma/oat cell carcinoma⍰ neuroendocrine tumor that can lead to multiple paraneoplastic syndromes
        i. Lambert eaton⍰ proximal muscle weakness that gets better throughout the day
        ii. Cushing Disease⍰ excess ACTH release
        iii. SIADH⍰ excess ADH relase ⍰ lead to euvolemic hyponatremia
        iv. Immunohistochemistry of the cancer
            1. Chromogranin +
            2. Synaptophysin +
    c. Squamous cell carcinoma⍰ PTHrP increase⍰ hypercalcemia
        i. PTHrP is NOT PTH
            1. So if PTHrP would increase⍰ calcium increases
            2. If calcium increases, it shuts off the Parathyroid gland and PTH does not get release (decrease PTH)
            3. Without PTH, there is no activation of the Vit D due to the loss of activation of the 1 alpha hydroxylase enzyme
            4. Lab Values
                a. Increased PTHrP
                b. Decreased PTH
                c. Increased calcium
                d. Decreased phosphate
                e. Decreased calcitriol (activated Vit D)

9. D
    a. Bilobed nucleus that is CD15 and CD30 positive ⍰ reed sternburg cells⍰ associated with Hodgkins Lymphoma
        i. Associated with EBV
            1. dsDNA linear virus⍰ group 1 Baltimore classification
        ii. Types
            1. Nodule sclerosis ⍰ most common
            2. Mixed

        3. Lymphocyte predominant
            a. Is not associated with EBV
            b. CD45+
            c. Not only will it have reed sternburg cells, but it will also present with CD45+ cells
        4. Lymphocyte depleted worst prognosis

10. C
    a. Scratchy throat and erythema in the oral mucosa Pharyngitis Strep Pyogenes (GAS strep)
        i. Gram positive cocci, beta hemolytic, catalase negative, coagulase negative
    b. Complications
        i. Non-suppurative complications (no pus involvement)
            1. Rheumatic fever Type 2 HSN
                a. Can only be caused by pharyngitis NOT IMPETIGO
                b. Molecular mimcry against the M-protein, causing an attack on the myosin in the heart
                c. JONES criteria
            2. PSGN Type 3 HSN
                a. Nephritic syndrome
                b. Subepithelial humps on EM
                c. Periorbital swelling and coca cola urine
                d. Can be caused by either a pharyngitis or an impetigo
        ii. Suppurative complication/Presentations (pus involvement)
            1. Pharyngitis
            2. Cellulitis
            3. Erysipelas
            4. Scarlet fever

11. A
    a. Patient who is coming in with active TB prescribe the RIPE drugs for 2 months
        i. Isoniazid causes peripheral neuropathy is due to the Vit B6 deficiency
            1. Supplementing with pyridoxine to prevent the peripheral neuropathy
        ii. Rifampin DNA dependent RNA polymerase stop transcription
            1. Red-orange urine, CYP450 activator
        iii. Pyrazinamide unknown MOA
            1. Hepatotoxicity, hyperuricemia
        iv. Ethambutol arabinosyltransferase inhibition
            1. Red-green color blindness

12. C
    a. AA female who presents with bilateral hilar lymphadenopathy Sarcoidosis
        i. Sarcoidosis
            1. Lab values hypercalcemia and elevated ACE

        ii. Sarcoidosis is a chronic disease, the patient can develop an anemia of chronic disease
            1. Due to the elevated IL-1, IL-6, TNF-alpha, we start making the acute phase proteins by the liver⍰ up regulate the formation of hepcidin
            2. Hepcidin inhibits the ferroprotein channel⍰ stop the reabsorption and/or release of iron
                a. Stopping the reabsorption-⍰ decreased total serum iron
                b. Stopping release from the storage in macrophages⍰ ferritin increases
                c. TIBC decreases
                d. Saturation=total serum iron/TIBC⍰ saturation increases

13. C
    a. PR3-ANCA=C-ANCA
        i. Wegners aka granulomatosis with polyangiitis (GPA_
            1. Symptoms
                a. URT involvement
                    i. Mucosal and submucosal necrosis of the nasal mucosa
                    ii. Nasal ulcers
                b. LRT involvement
                    i. Necroticing granulomas
                c. Renal involvement
                    i. Urine analysis showed RBC⍰ nephritic syndrome
                        1. RPGN aka crescentic glomerulonephritis
                        2. Crescents on LM, pauci immune Immunofluorescence
            2. Pathogenesis
                a. The antibody is attacking the lung and kidney ⍰ leads to an inflammatory infiltrate in the lungs and the kidneys and vasculature that leads to the granuloma formation

14. D
    a. Flattened diaphragm=COPD ⍰ hyperinflation of the lungs causes the diaphragm
    b. Barrel chest/Increase in anterior to posterior diameter⍰ Emphysema
    c. Increase in the TLC and RV⍰ obstructive disease
    d. In this vignette the patient has been smoking 3 cigarettes a day for 4 years ⍰ THIS IS NOT SIGNIFICANT SMOKING HISTORY
        i. Centriacinar emphysema⍰ 40/50 pack history
    e. 42 year old patient with insignificant hx presenting with emphysema⍰ panacinar emphysema caused by alpha 1 anti-trypsin deficiency
        i. PiZZ mutation that causes the misfolded protein to accumulate in the liver/hepatocytes

            1. PAS positive granules in the hepatocytes
    f. Answer Choices
        i. A⍰ Asthma
        ii. B⍰ Chronic bronchritis
        iii. C⍰ Pneumonia
        iv. E⍰ Chronic bronchitis
            1. Anytime you have increase vascularity in the lungs ⍰ is caused by the hypoxic conditions

15. C
    a. Worsening asthma who has been taking salbutamol
        i. Salbutamol is a SABA (beta 2 agonist)
            1. Exacerbation management
    b. When a patient has a worsening asthma ⍰ give the patient ICS ⍰ nuclear receptor

16. F
    a. Neck is hyperextended (tripod positioning) in a patient who us unvaccinated ⍰ Epiglottis
        i. Inflammation of the epiglottis⍰ medical emergency, patient needs to be intubated
        ii. Present with a Thumb sign on X-ray
        iii. Organism⍰ H. influenza
            1. Typeable aka encapsulated
                a. Causes
                    i. Epiglottitis
                    ii. Meningitis
                b. Virulence factors
                    i. PRP capsule
                    ii. IgA protease ⍰ cleave the IgA to cause the organism to be more likely to cause damage
                c. Prevented
                    i. Vaccine
            2. Non-typeable form is not encapsulated
                a. Causes
                    i. Sinusitis
                    ii. Otitis media
                b. Virulence factors
                    i. IgA protease ⍰ cleave the IgA to cause the organism to be more likely to cause damage

17. E
    a. Correction to the stem: On a snowy day in January, a 40-year-old woman presents to the physician with a sore throat, rhinitis, and cough. Her temperature is 100.4F (38C), pulse is 108/min, and blood pressure is 110/80 mmHg. He denies any gastrointestinal symptoms. ~~Which of the following is associated with the causal agent?~~ Vital signs are within normal limits and physical examination is unremarkable beyond mild pharyngeal erythema and inflamed nasal mucosa. PCR testing of a mucous swab sample shows an enveloped, positive sense single-stranded organism as the causative agent.

Which of the following appropriately characterizes the identified organism?

- b. Cough, rhinitis and sore throat⍰ Common cold
    - i. Common cold in the winter⍰ corona virus
        1. Organism
            - a. +ssRNA enveloped (helical form)
        2. Virulence
            - a. Spike proteins⍰ hemagglutination
- c. Answer choices
    - i. A⍰ Fiber penton base⍰ adenovirus
    - ii. B⍰ Capsid proteins of rhinovirus
    - iii. C⍰ Dependent on the F protein⍰ RSV and HPIV
    - iv. D⍰ Rhinovirus

18. C
- a. Rheumatoid arthritis⍰ chronic disease⍰ anemia of chronic disease
    - i. In anemia of chronic disease we are trying to stop the organism/chronic disease/cancer from getting access to iron⍰ because infection or cancer needs iron to be able to replicate and survive
        1. WE DO NOT WANT IT TO SURVIVE, SO WE HIDE THE IRON

| | Total serum iron | Ferritin | TIBC | Transferrin Saturation =total serum iron/TIBC | Hepcidin | Cytokines |
|---|---|---|---|---|---|---|
| IDA | Low | Low | High | Low | Low | Low |
| ACD | Low | High | Low | High | High | High |

19. B
- a. Pneumonia and hyponatremia⍰ legionella ⍰ grows on BCYE agar
- b. Agars
    - i. Tinsdale/Tellurite agar⍰ C. Diptheria
    - ii. Eaton agar⍰ mycoplasma pneumonia
    - iii. Bordert Genou/Regan Lowe⍰ pertussis
    - iv. Lowenstein Jensen⍰ TB
    - v. Chocolate agar supplement with factor 5 and 10 ⍰ H. influenza
    - vi. Thayer Martin⍰ Neisseria
    - vii. MacConkey⍰ klebsiella
    - viii. Ashdown Agar⍰ burkholderia
        1. Cauliflower heads!!!
    - ix. Sabourad agar⍰ fungi
    - x. Blood agar⍰ Moraxella

20. E
- a. Cells with thin processes⍰ hairy cell leukemia
    - i. Hairy cell leukemia is a B-cell Lymphoma
        1. CD 103+ Cd11C+
        2. Causes a dry tap⍰ fibrosis of the bone marrow

            a. Aplastic anemia⍰ hypocellular bone marrow with fat predominance
        3. TRAP stain positive
  b. Answer choices
      i. A⍰ Mantle cell lymphoma (most common T-cell lymphoma in a male)
          1. Upregulation of cyclin D
      ii. B⍰ T-cell leukemias or lymphomas
      iii. C⍰ Multiple myeloma
      iv. D⍰ Hodgkins or nonhodgkins lymphoma

21. B
  a. Patient who is coming with a positive PPD test but no Chest X-ray findings=Latent TB
      i. For Latent TB give Isoniazid +pyridoxine
  b. After the 4 months a positive PPD test means the drug did not work!!!!--> isoniazid resistance
  c. If the question, what drug should the patient be prescribed now⍰ give rifampin for 4 months
  d. If we had active Tb aka positive chest X-ray⍰ RIPE drugs

22. C
  a. Preggo who has Plasmodium vivax
      i. Vivax and ovale have the dormant stage⍰ primaquine
  b. NEVER give a preggo primaquine
      i. Primaquine is also contraindicated in a patient who has G6PD deficiency!!!!
          1. It causes oxidation the glutathione!!
  c. If a woman is pregnant with vivax and ovale⍰ maintain treatment with chloroquine or mefloquine
      i. If resistance Is present⍰ mefloquine
      ii. No resistance⍰ chloroquine
  d. Once she gives birth add the primaquine

23. D
  a. JAK2 mutation aka JAKSTAT mutation⍰ myeloproliferative disorder aka polycythemia vera
      i. The receptor is mutated where you no longer need the ligand aka EPO, the JAKSTAT receptor is constitutively active and always promoting reticulocyte differentiation⍰ increased RBC formation ⍰ increased hemoglobin
      ii. This will cause a negative feedback on the kidney causing the EPO to be low

24. D
  a. Iron Deficiency anemia
      i. Kolinochyia⍰ spooning of the nails
      ii. Glossitis ⍰ beefy red tongue
      iii. Wanting to consume ice⍰ PICA syndrome
  b. IDA is associated with Plummer vinson syndrome
      i. Triad of symptoms including IDA, glossitis, esophageal webs

c. Answer choices
    i. A⍰ Vit b12 or Vit b9 deficiency
    ii. B⍰ Vit B12 deficiency
        1. Vegans
        2. Pernicious anemia
        3. Crohns disease
        4. Gastrectomy
    iii. C⍰ Leukemias or lymphomas
    iv. E⍰ anemia of chronic disease

25. D
    a. Schuffner dots⍰ Plasmodium vivax or ovale
        i. Dormant stage⍰ we have to add primaquine

| | Which RBCs are Affected | Fever⍰ associated with hemolysis of the RBC | Diagnostic Feature |
|---|---|---|---|
| Plasmodium Vivax/Ovale | Immature | Every 48 hours aka every 3rd day<br>Day 1, day 3, day 5, day 7, etc | Schuffner dots |
| Plasmodium Malarie | Mature | Every 72 hrs aka 4th day<br>Day 1, day 4, day 7, day 10, etc | Band<br>Rose like schiznots |
| Plasmodium falciparum | Both immature and mature | Cycling every day<br>High fever multiple times a day | Banana shaped gametocytes<br>Trophozoites |

26. B
    a. Patient who is presenting with a 14;18 translocation ⍰ folliculat lymphoma
        i. Richter transformation⍰ ability of a leukemia or a NHL to transform in a diffuse large B-cell Lymphoma (DLBCL)
            1. Follicular Lymphoma
                a. 14;18 translocation
            2. Burkitt lymphoma
                a. 8;14 translocation
            3. CLL
            4. SLL
    b. Answer choices
        i. A⍰ 15;17 translocations
        ii. C⍰ crushed little lymphocytes
        iii. D⍰ JAKSTAT mutation
        iv. E⍰ CD30 and Cd15 positive cells (reed sternburg cells, bilobed owl eye cells)
    c. Translocations
        i. 9;22⍰ CML
        ii. 15;17⍰ AML

        iii. 8;14⍰ Burkitt
        iv. 14;18⍰ follicular
        v. 12;21⍰ ALL
        vi. 11;14⍰ mantle cell

27. D
    a. We have a patient presenting with mucous gland hypertrophy⍰ patient has chronic bronchitis
        i. Complications of chronic bronchitis
            1. Resorption/obstructive atelectasis Causes
                a. A, B, C
                    i. Aspiration
                    ii. Bronchitis, bronchial asthma, bronchiectasis
                    iii. Cancers
            2. Cor pulmonale
                a. The chronic bronchitis leads to hypoxic vasoconstriction of the pulmonary vasculature⍰ increase in the PVR⍰ pulmonary HTN⍰ increase in the RV afterload⍰ RV concentric hypertrophy

28. D
    a. Correction to the stem:
    b. ~~A 68-year-old man comes to his physician's office complaining of shortness of breath after performing physical activity. The patient's smoking history is 70 pack year in 40 years. He has had a 6-year history of episodic productive cough, which lasts up to 5 months at a time. Initially, the productive cough was odorless but over time, it became purulent and coupled with halitosis. A chest X-ray shows the presence of peripherally-extended airway markings. If a biopsy of the lungs were performed, th~~
    c. A 7-year-old girl is brought to the physician by her mother because of several bowel movements with foul-smelling stools that float over the past 3 weeks. She has a history of recurrent respiratory tract infections and has previously been diagnosed with an autosomal recessive disorder affecting the long arm of chromosome 7. Prior quantitative pilocarpine iontophoresis results have shown elevated sweat chloride levels. Physical examination today shows several soft, painless growths in her sinuses and mild finger clubbing. The most common cause of death in patients with her disorder is characterized by which of the following morphological features on biopsy?
        i. We have a little girl who presents a mutation on chromosome 7 and elevated chloride in sweat⍰ CF
        ii. CF causes Bronchiectasis ⍰ severely dilated bronchi and bronchioles caused by the chronic/repetitive respiratory infections
            1. Look for purulent smelly productive sputum to indicate a bronchiectasis
    d. Answer choices
        i. A⍰ Emphysema
        ii. B⍰ Chronic bronchitis
        iii. C⍰ Asthma

        iv. E⍰ ARDS/hyaline membrane formation

29. C
    a. CF patient who has infections ⍰ pseudomonas aeruginosa
        i. Organism
            1. Gram negative rod, oxidase positive, catalase positive
        ii. Virulence factors
            1. Exotoxin A⍰ ADP Ribosylation of the EF2⍰ stop translation
                a. Similar function of the diptheria toxin
            2. Pyocyanin and pyoverdine
            3. Grape like scent
    b. Answer choices
        i. A⍰ Shigella
        ii. B⍰ Ecoli
        iii. D⍰ S. Pneumonia
            1. Optochin resistant is S. viridians
        iv. E⍰ S. Aureus

30. A
    a. Increased intensity of the pulmonic component of S2⍰ loud P2⍰ loud closure of the pulmonic valve⍰ Pulmonary HTN
        i. S2 is where the pulmonic and aortic valve close
        ii. We have a young female presenting with Pulmonary HTN
            1. BPMR2 receptor mutation⍰ hypertrophy of the smooth muscle⍰ vasoconstriction of the pulmonary vasculature⍰ increase in the PVR⍰ pulmonary HTN⍰ right sided heart failure⍰ JVD, peripheral edema
            2. Increase in the vasoconstrictors⍰ endothelin and thromboxane
                a. Treat by giving
                    i. Bosentan⍰ endothelin receptor antagonist
                    ii. aspirin⍰ cox1/2 inhibitor⍰ decrease thromboxane
            3. Decrease in the vasodilators ⍰ NO and Prostacyclin aka PGI2
                a. Treat by giving
                    i. Sildenafil⍰ phosphodiesterase inhibitor ⍰ increase in the cGMP⍰ increase NO
                    ii. Epoprostenol⍰ prostacyclin analog

31. E
    a. We have a 60 year old woman with a middle lobe consolidation and positive egophony⍰ pneumonia
        i. Most common cause of typical pneumonia⍰ S. pneumo
            1. Organism
                a. Gram positive diplococci, lancet shaped, catalase negative, coagulase negative, alpha hemolytic
            2. Virulence factors
                a. Pneumolysin
                b. IgA protease

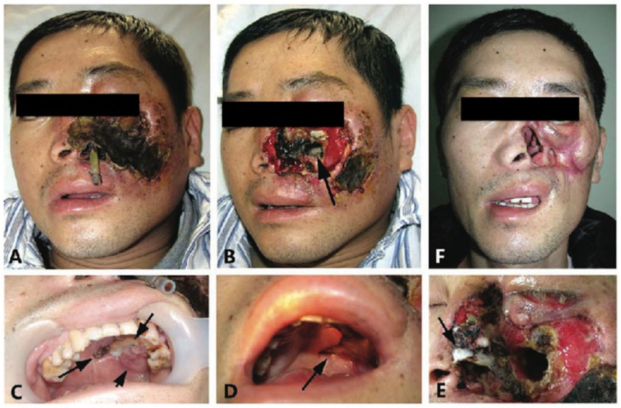
            c. Encapsulated
        3. Diagnose
            a. Quelleng test
        4. Preventable
            a. Vaccine

32. B
    a. Patient coming in with fever, nausea, diarrhea, SOB ⍰ influenza
        i. Organism
            1. -ssRNA, segmented, enveloped
        ii. Virulence factors
            1. Hemagluttin for entry
            2. Neuramindase for exit
        iii. Mutations
            1. Antigen shift
                a. Is the mixing of different segments between two different flu serotypes
            2. Antigenic drift
                a. Point mutations
                b. Reason why we need flu vaccine every year

33. E
    a. Intraerythrocytic ring structures⍰ malaria or babiesosis
    b. We are in the Midwest ⍰ babiesosis
        i. Transmitted by the Ixodes Tick
            1. Associated for camping, hiking, forest rangers

34. B
    a. Peroxidase positive (MPO positive granules/rods)⍰ AML
        i. 15;17 translocation
    b. Answer choices
        i. A⍰ 12;21 translocation
        ii. C⍰ elderly patient and crushed little lymphocytes
        iii. D⍰ 9;22 translocations
        iv. E⍰ CD30 and CD15 positive cellS

35. E
    a. Immunocompromised patiet who is infected by a fungus with acute angle branching (45 degree angle)⍰ aspergillus
        i. Risk factors
            1. Neutropenia
                a. Patient with CML⍰ they do not have any FUNCTIONAL neutrophils
    b. Answer choices
        i. A⍰ Rhizopus aka Mucor species⍰ right angle branching
            1. Frontal lobe and nasal necrosis
        ii. B⍰ Coccides immitus
        iii. C⍰ Histoplamosis



        iv. D legionella

36. C
    a. Tender inguinal lymphadenopathy Yersina pestis
        i. Associated with fleas and rodents
    b. Answer choices
        i. A pseudomonas
        ii. B Ebola and Marburg syndrome and hanta virus
        iii. D S. pneumo or H. infuenza
        iv. E TB
37. C
    a. Taxles peripheral neuropathy and HSN
    b. Answer choices
        i. A doxorubicin and danurubicn
            1. Prevented by dexarazone
        ii. B cyclophosphamide
            1. Prevented with mesna
        iii. D cisplatin
            1. Prevent by amifostine
        iv. E bleomycin and busulfan
38. A
    a. Enclosed space aka the auto repair shop/garage/home/barn
    b. Rodent exposure hanta virus or yersinia
    c. Answer choices
        i. B Cornflower growth/head on Ashdown agar
        ii. C red currant jelly sputum
            1. Most common cause of pneumonia in a alcoholic
        iii. D obligate intracellular organism
            1. IT DOES NOT GRAM STAIN
            2. Culture negative endocarditis
        iv. E Epiglottitis and thumb print sign on Chest X-ray
            1. Chocolate agar supplemented with factor 5 and 10
39. D
    a. Inclusion bodies on on BAL chlamydia psittachi
        i. Virulence Factors
            1. Elementary bodies infectious form
            2. Reticular bodies replicating form (intracellular)
        ii. Cause
            1. Atypical pneumonia
            2. Associated with a parrot exposure
        iii. Organism
            1. Obligate intracellular organism does not gram stain
            2. However, they can say a gram negative, intracellular short bacillus
            3. It will not grow on an agar
40. D
    a. Coin lesions on Chest X-ray pulmonary hamartoma (pulmonary growth of cartilage)

b. Answer choices
    i. A neuroendocrine tumor small round blue cells, salt and pepper appearance
    ii. B Secondary tumor of tumor
    iii. C Keratin pearls, keratinization, islands or nests of cells
        1. Associated with PTHrP hypercalcemia
    iv. E associated with carcinoid syndrome
        1. Increased serotonin diarrhea, flushing, bronchospasms

41. B
    a. Dry tap on bone marrow aspiration aplastic anemia or a hairy cell leukemia or myelofibrosis
    b. Answer choices
        i. A AML
        ii. C malaria
        iii. D EBV (hodgkins lymphoma or Burkitt lymphoma)
        iv. E Sideroblastic anemia aka lead poisoning
42. A
    a. Small cells with stippled nuclei
        i. Smalls cells are seen with small cell carcinoma/oat cell
            1. Paraneoplastic syndromes
                a. SIADH euvolemic hyponatremia
                b. Cushing diseae high cortisol, hyperglycemia
                c. Lambert eaton proximal muscle weakness
43. D
    a. Wheezing and SOB worse with exercise and cold air asthma
    b. Pathophysiology
        i. Type 1 IGE mediated HSN reactions (Th2 mediated)
            1. IL4—call in IGE
            2. IL5 call in eosinophils
            3. IL-13 increase mucous production
            4. IL-10 Shut off the Th1 response
        ii. Diagnostic feature s
            1. Charcot layden cyrstals eosinophilic crystals
            2. Crushmann spirals necrotic epithelial cells In the sputum
44. D
    a. Hypocellular bone marrow with predominant fat cells aplastic anemia
        i. Pancytopenia
            1. Low RBC low Hb
            2. Low Platelet <150,000
            3. Low WBC <4,500
45. C
    a. CD19, CD20+ positive cells in the presence of 32% blasts
        i. If blasts are more than 20%--> acute leukemia
        ii. CD19+ CD20 B cell ALL good prognosis

socrative

Name ____________
Date ____________

# Aug 2022 RHS Exam Review Part 1

Score ____________

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**1.** A 72 year old female comes to the primary care physician because of a 1 week history of ringing in his ears and trouble hearing.  The patient was recently diagnosed with prostate cancer and started on chemotherapy treatment cyclophosphamide, bleomycin, pacetaxel, cisplatin, methotrexate and leucovorin. Weber and Rinne testing shows bilateral sensorineural hearing loss. Which of the drugs is responsible for this patient symptoms?

Ⓐ Cyclophosphamide
Ⓑ Pacetaxel
Ⓒ Methotrexate
Ⓓ Cisplatin
Ⓔ Bleomycin
Ⓕ Leucovorin

**2.** A 24-year-old female is brought to the emergency department because of a 1 week history of progressive shortness of breath.  She had a lower respiratory tract infection 2 weeks ago, Laboratory studies show hemoglobin 9.4 g/dL (N: 10.5 –12.4 g/dL). Laboratory testing indicate that the patient's direct coombs test is positive, and she has high serum LDH, absent serum haptoglobin.  Which of the following additional clinical findings is most likely suggestive of intravascular hemolysis?

Ⓐ Hemosiderinemia
Ⓑ Splenomegaly
Ⓒ Increased direct bilirubin
Ⓓ Dacrocytes
Ⓔ Heinz bodies

**3.** A 65-year-old man comes to the emergency department because of a one-day history of severe epigastric pain and sudden onset dyspnea. He has had previous episodes of epigastric pain following a night of hard drinking. He has a 25-year history of heavy alcohol drinking and has smoked half a pack of cigarettes a day for 40 years. Chest x-ray shows a ground-glass appearance and the presence of bilateral diffuse interstitial infiltrates. Which of the following is most likely responsible for his respiratory distress?

Ⓐ Alcohol History
Ⓑ Smoking History
Ⓒ Age
Ⓓ Pancreatitis
Ⓔ Male sex

**4.** A 12-year old male is brought to the primary care physician because of a 2 day history of coryza, congestion and sore throat. The patient's family report that they had similar symptoms over the winter holiday season. Diagnostics of his respiratory secretions show a large enveloped helical shaped, positive sense, single stranded RNA virus. Which of the following is the causal agent?

Ⓐ Coronavirus
Ⓑ Adenovirus
Ⓒ Influenza
Ⓓ Parainfluenza virus
Ⓔ Rhinovirus

**5.** A 65-year-old woman visits the physician complaining of worsening pain in her left shoulder and arm for the past month and worsening pain and dryness in her left eye for the past two weeks. She has a 22-pack-year smoking history, eats a healthy diet and does not drink. She has lost 5 kg of weight in the past 2-months despite no changes in her diet or activity levels. Vital signs are within normal limits. Physical exam reveals enophthalmos, ptosis and miosis of the left eye, anhidrosis of the left face, and allodynia on the medial aspect of her left scapula extending through the territory of the ulnar nerve in the left arm and forearm. The physician orders a chest X-ray which identifies an 5 cm opacity in the left upper lung lobe. Which of the following is the most likely cause of the pain in the patient's left arm?

Ⓐ Neoplastic invasion into the left stellate ganglion
Ⓑ Release of vasoactive amines into systemic circulation
Ⓒ Neoplastic invasion causing obstruction of the SVC
Ⓓ Ectopic production of PTHrP
Ⓔ Neoplastic invasion of the left dorsal cervical nerve roots

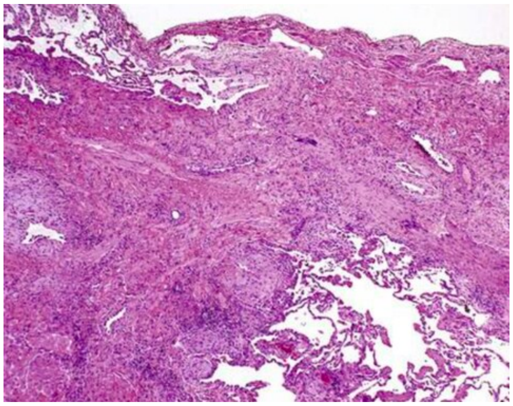
**6.** A 35-year-old woman comes to the physician because she felt a lump in her breast while doing a self-examination in the shower. An MRI of the breast with biopsy shows invasive ductal carcinoma. The patient undergoes double mastectomy and is started on an anticancer drug that prevents polymerization of microtubules. Which of the following drugs was most likely administered to this patient?

Ⓐ Docetaxel
Ⓑ Paclitaxel
Ⓒ Vinblastine
Ⓓ Tamoxifen
Ⓔ Raloxifene
Ⓕ Leuprolide
Ⓖ Goserelin

**7.** A 68-year-old woman comes to the physician with complaints of dyspnea and trouble catching her breath with exertion. She has had a productive cough for the past 4 months, and when questioned about this cough she says she has had episodes of chronic cough which began 3 years prior and occur episodically, lasting about 3 months at a time. The patient history is significant for smoking 20-pack years over 30 years. What will most likely be seen in this patient's lung biopsy?

Ⓐ Hyperplasia of mucus glands
Ⓑ Enlarged air spaces
Ⓒ Alveolar membrane hyalinization
Ⓓ Extensive fibrosis
Ⓔ Curschmann spirals

**8.** A 65-year-old man comes to the physician because of an 8-month history of dry cough and progressively increasing shortness of breath. He has never smoked and retired as a bank manager 5 years ago. Physical examination shows mid-inspiratory crackles over both the lower lung regions. An x-ray of the chest shows bilateral interstitial markings over the basal lung fields. A CT scan of the chest shows honeycomb cysts in lower lobes of both the lungs. A transbronchial biopsy of the lungs is performed and a photomicrograph of an H & E stained lung tissue is shown. Which of the following is the most likely course of this patients condition?



Ⓐ Complete remission with high dose of steroids

Ⓑ Spontaneous remission

Ⓒ Recovery with antibiotics

Ⓓ Relentless progression

Ⓔ Complicated by L HF

**9.** A 35-year-old woman comes to the physician after a 3- month trip to Asia because of hemoptysis and a cough for the past 4 weeks. She has been febrile and lost 5 kg since her last visit 4 months ago. An x-ray of the chest shows a cavitary lesion within the lung parenchyma, with irregular margins in upper right lobe. An ELISA assay shows high amounts of IFN-gamma. The patient is diagnosed with reactivation of TB infection and started on appropriate primary medication. Which of the following is the most appropriate therapy?

Ⓐ Isoniazid, rifampin, pyrazinamide and ethambutol

Ⓑ Isoniazid

Ⓒ Rifampin and Pyridoxine

Ⓓ Rifampin and dapsone

Ⓔ Isoniazid, pyrazinamide, ethambutol

**10.** A 15 year old female comes to the primary care physician because of a 6 month history of fatigue and heavy periods. She has no other known medical conditions and takes no mediations. Physical examination shows a pale appearance. Lab studies show low hemoglobin, low hematocrit, low MCV. Which of the following medications is the most appropriate treatment?

Ⓐ folic acid

Ⓑ vitamin b12

Ⓒ erythropoietin

Ⓓ filgrastim

Ⓔ ferrous sulfate

Ⓕ vitamin b6

**11.** A 66-year-old man comes to the emergency department because of a cough which started 2 days ago. He states that the cough is productive with rust colored sputum. An x-ray of the chest shows consolidation. A sputum culture shows positive growth of gram positive, catalase negative, β-hemolytic cocci. Which of the following findings is most likely in the lungs of this patient? Which of the following virulence factors most likely contributes to the chronic carriage of the causal agent causing this patient's symptoms?

Ⓐ Biofilm

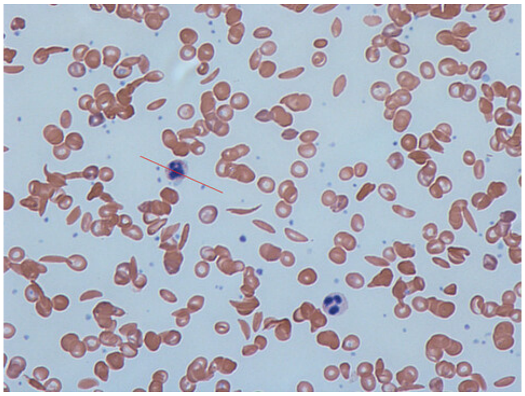
Ⓑ PRP Capsule

Ⓒ LPS Endotxoin

Ⓓ Pyocyanin and pyoverdin

Ⓔ Streptokinase

**12.** A 23-year-old African Caribbean woman is rushed to the emergency department due to excruciating pain in her right leg, along with a productive cough and fever. The patient has been suffering from bouts of pneumonia for the past two years, which she was treated with medication and antibiotics. She recently started marathon training and states her symptoms have been getting worse. Physical examination finds fullness in the left upper quadrant, the beginnings of an ulcer on her right leg and consolidation the left lower lobe of her lung. Electrophoresis shows presence of HbS and HbF. Which of the following pathogenic mechanism of this condition is most likely affected?



Ⓐ Synthesis of the RBC cell membrane proteins

Ⓑ Mutation affecting the GPI protein anchor

Ⓒ Synthesis of malfunctioning hemoglobin

Ⓓ Antibody attack on the RBC

Ⓔ Decreased synthesis of Alpha globin chains.

**13.** A 39-year-old African American woman comes to the emergency department because of a 2-month history of cough. She also reports a fever and night sweats for the past week. Her temperature is 100.5F (38C), pulse is 99/min, blood pressure is 132/86 mm Hg, and respirations are 28/min. A CT of the chest shows bilateral hilar lymphadenopathy with nodules in the lung interstitium. Laboratory studies show hypercalcemia. Which of the following histological features is most likely on a biopsy of the nodules?

Ⓐ Schaumann bodies
Ⓑ Charcot Leyden Crystals
Ⓒ Keratin Pearls
Ⓓ Curschmann spirals
Ⓔ Geographical heterogeneity

**14.** A 6-year-old Asian boy is brought to the pediatrician by his mother because of increased fatigue and shortness of breath when playing outside with the neighborhood kids. He has been having feelings sadness over the last year because “his new baby brother died”. His mother confirms that she gave birth to a stillborn male who died in utero due to complications of pleural effusion, ascites and severe anemia. Physical examination shows mucosal pallor. No murmurs or abnormal breath sounds are heard on auscultation. Serum studies show decreased levels of hemoglobin and hematocrit with a mean corpuscular volume of 74.5 μm3. Peripheral blood smear shows teardrop shaped red blood cells and target cells. Which of the following defects in the alpha hemoglobin gene most likely seen in the patient's deceased brother?

Ⓐ Alpha alpha/--
Ⓑ Alpha -/alpha alpha
Ⓒ --/--
Ⓓ Alpha-/ --
Ⓔ Alpha-/alpha-

**15.** A 35-year-old woman comes to the office for evaluation of fatigue and exertional dyspnea. She has a history of systemic lupus erythematosus and is noncompliant with therapy. The patient takes naproxen as needed for joint pains. Vital signs are within normal limits. Examination shows mild pallor. The remainder of the examination shows no abnormalities. Which of the following additional lab findings best supports the cause of anemia?

Ⓐ Decreased Vit B12 concentration
Ⓑ Increased MCHC
Ⓒ High MCV
Ⓓ Decreased ferritin
Ⓔ Decreased TIBC

**16.** A 58-year-old man visits the physician complaining of weakness, fatigue and weight loss for the past six-months. He has lost approximately 10-kg during that with no significant change in activity level or diet. He states that he has been having increasing difficulty rising from a seated position or climbing stairs. He has a 25-pack-year smoking history. He coughs frequently during the examination but explains it’s just from his smoking. The physician suspects a paraneoplastic syndrome and orders a chest X-Ray which reveals multiple opacities in the left lung and biopsy reveal small round cells with scanty cytoplasm and finely granular chromatin. Which of the following is the origin of this tumor?

Ⓐ Neuronal
Ⓑ Myxoid
Ⓒ Lymphoid
Ⓓ Mesenchymal
Ⓔ Neuroendocrine

**17.** A 46-year old Asian-American woman visits the physician complaining of chest pain, shortness of breath, and a persistent cough for the past 3-weeks. She works as a personal trainer, has never smoked and consumes only a few alcoholic drinks a month. She is afebrile and her remaining vitals are within normal limits. Chest X-ray reveals a consolidation in the right lower lobe and she is initially diagnosed with community acquired pneumonia and started on empiric antibiotics. However, she fails to improve and repeat sputum cultures are negative for pathogenic organisms. Initial bronchoscopy was negative for endobronchial lesions but subsequent CT-guided core biopsy showed neoplastic mucin producing cells in a lepidic pattern extending along normal appearing alveolar septae. Genetic analysis of the sample is most likely to show which of the following mutations?

Ⓐ Mutation of anaplastic lymphoma kinase gene
Ⓑ Mutation of epidermal growth factor receptor gene
Ⓒ Deletion of the short arm of chromosome 3
Ⓓ Mutation of of cyclin dependent kinase inhibitor 2A gene
Ⓔ Inactivating mutation of gene encoding retinoblastoma protein

**18.** A 45-year-old man comes to the physician with complaints of progressive dyspnea and RUQ pain which began a month ago. Upon inspection, the physician notes scleral icterus and the patient breathes through pursed lips. The patient reports a 10-pack year smoking history for 15 years and a family history of similar symptoms on his maternal and paternal sides. Spirometry reveals a decreased FEV1:FVC ratio. Liver shows abnormally folded protein which is not secreted into the serum and accumulating in the hepatocytes. Which of the following is most likely affecting in this patient?

Ⓐ Bilirubin

Ⓑ Crushman Spirals

Ⓒ Non-caseating granulomas

Ⓓ Alpha 1 anti trypsin

Ⓔ Glycogen

**19.** A 50 year-old female arrives to the primary care physician 3 month history of fatiguability and shortness of breath. on exertion. She underwent intestinal resection for IBD 2 years ago. Laboratory studies show hemoglobin 6 g/dL (N: 10.5–12.4 g/dL), MCV of 108 (N: 80-100). Which of the following complication is most likely to develop in this patient?

Ⓐ Acute renal failure

Ⓑ Esophageal webs

Ⓒ Subacute combined degeneration of spinal cord

Ⓓ DIC

Ⓔ Hypersplenism

**20.** A 53-year-old man comes to the physician because of trouble urinating and increased frequency of urination. Digital rectal examination shows a hard nodular and irregular prostate. Transrectal ultrasonography shows stage A prostate cancer. Treatment with a GnRH-agonist is initiated. What is the mechanism of action of the drug that is co-administrated to prevent flaring of the tumor?

Ⓐ Blockage of androgen receptors.

Ⓑ Activation of androgen receptors

Ⓒ Decreased androgen aromatization

Ⓓ Blockade of estrogen receptors

Ⓔ Decreased androgen synthesis

**21.** A 15-year-old boy is evaluated for fever, headache, malaise, and cough 3 weeks after returning from summer camp. Lung auscultation is unremarkable. Chest x-ray reveals nodular infiltrates. The patient's blood samples are collected for analysis in anticoagulated tubes, which are transported submerged in ice; when taken out several minutes later, turbidity and clumping are noted. Warming the tube to body temperature leads to rapid dissolution of the clumps.Which of the following antibiotic resistance mechanism against B lactam drugs is most associated?

Ⓐ Multi drug efflux pump
Ⓑ Modified penicillin binding protein
Ⓒ Absence of cell wall target
Ⓓ Thick lipid mycolic acid cell wall
Ⓔ Secretion of penicillinase

**22.** A 45-year-old man comes to the physician due to pain, swelling, and erythema affecting his right leg. He says that he suffered a minor cut to his leg a few days ago while cleaning his garage. Physical examination shows an indurated region surrounding a minor laceration that is draining a purulent exudate. He is diagnosed with cellulitis and started on the appropriate treatment. Gram stain of the exudate shows gram-positive cocci in clusters. What condition is the patient most likely presenting with?

Ⓐ Shingles
Ⓑ Hand, foot and mouth disease
Ⓒ Gas gangrene
Ⓓ Furuncles
Ⓔ Abscess
Ⓕ Cellulitis

**23.** Several residents of a long-term care facility develop febrile illness within a short period of time. Symptoms include fever, nonproductive cough, myalgia, rigors, dyspnea, and diarrhea. Organisms found in induced sputum samples stain poorly with Gram stain but are visualized easily using silver stain. Urine testing for bacterial antigens is positive in most of the affected individuals. Which of the following is the most likely causal agent?

Ⓐ Legionella
Ⓑ Pseudomonas Aeruginosa
Ⓒ Chlamydophila
Ⓓ S. pneumonia
Ⓔ Mycoplasma pneumonia

**24.** A 24-year-old man comes to the office due to paroxysmal episodes of breathlessness and wheezing for the past 6 months. He does not recognize any triggers for these episodes and reports they are not associated with exercise or stress. The patient has no history of recent illness. He had eczema as a child. The patient has no other medical conditions and takes no medications. Vital signs are within normal limits. Lung examination shows good air movement and no wheezing. Sputum microscopy reveals many granule-containing cells and crystalloid masses. Which of the following is most likely associated with the this patient condition?

Ⓐ Type 1 IgE mediated Hypersensitivity reaction

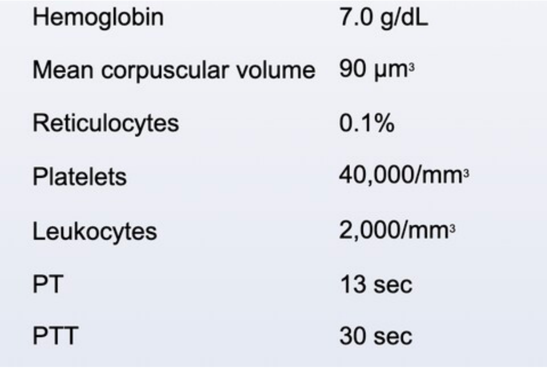
Ⓑ Destruction of elastin within small airways

Ⓒ Damage to the alveolar capillary membrane

Ⓓ Deficiency of alpha 1 anti-trypsin

Ⓔ Impaired mucocillary elevator

**25.** A 25-year-old woman comes to the office due to significant fatigue. Several weeks ago, the patient had a weeklong episode of intermittent fever and severe body aches. Over the last 2 weeks, she has been too tired to complete her normal jogging routine in the mornings and has had to take naps after returning home from work. The patient has no chronic medical conditions and takes no medications. Temperature is 37.2 C (99 F), pulse is 110/min, and respirations are 20/min. Examination shows pale lips and conjunctivae. The abdomen is soft and there is no hepatosplenomegaly. Examination of the extremities is unremarkable, and no lymphadenopathy is present. Laboratory results are shown. Peripheral blood smear reveals normocytic, normochromic red blood cells, and other cell types appear morphologically normal. Bone marrow biopsy shows a hypocellularity with fat predominance. Which of the following cells is most likely being destroyed?



| | |
|---|---|
| Hemoglobin | 7.0 g/dL |
| Mean corpuscular volume | 90 $\mu m^3$ |
| Reticulocytes | 0.1% |
| Platelets | 40,000/$mm^3$ |
| Leukocytes | 2,000/$mm^3$ |
| PT | 13 sec |
| PTT | 30 sec |

Ⓐ Common myeloid progenitors

Ⓑ Common lymphoid progenitors

Ⓒ Reticulocytes

Ⓓ Hematopoietic stem cells

Ⓔ Lymphoblast

**26.** A 45-year-old man comes to the emergency department due to 2 weeks of chest pain and cough. He has a history of advanced HIV and has taken his antiretroviral medications inconsistently over the past few months. Temperature is 38.1 C (100.6 F). Crackles are heard on pulmonary examination. CD4 cell count is 98/mm$^3$. Chest x-ray reveals lung nodules and hilar lymphadenopathy. A bronchoscopy is performed. Mucicarmine staining of the patient's bronchoalveolar fluid reveals budding yeast. What is a feature of the most likely causal agent in this patient?

Ⓐ Capsule

Ⓑ Pseudo hyphae

Ⓒ Flagella

Ⓓ Germ tubes

Ⓔ Slime layer

**27.** An 88-year-old man is brought to the emergency department by his daughter because of worsening memory problems over the past 3 years. He was diagnosed with Alzheimer’s 4 years ago and his condition has gradually worsened. He is no longer able to remember a memory formed 2 hours ago and he does not remember his wife’s passing last year. Which of the following changes to his brain would be expected?

Ⓐ Continuous efflux of Ca from intracellular to the extracellular

Ⓑ Increased intracellular proteins

Ⓒ Reduced protein synthesis

Ⓓ Damage to the mitochondrial membrane

Ⓔ Reprogramming of stem cells

**28.** An 8-year-old girl is brought to the emergency department with difficulty breathing. She has a history of mild persistent asthma for which she carries a rescue inhaler Since her last regular office visit, her symptoms have worsened in frequency. Despite regular use of her prescribed medications, she is now suffering from asthma symptoms on most days and waking up at night with difficulty breathing 4 to 5 times nights per week. The patient is treated appropriately and stabilized before being sent home. Which of the following changes should be made to her home medications for long-term control of her asthma?

Ⓐ Oral furosemide

Ⓑ Inhaled ipratropium

Ⓒ Oral theophylline

Ⓓ Inhaled salmeterol

Ⓔ Inhaled glucocorticoids

**29.** A 25-year-old 20-week gestatoin female comes to the physician requesting antimalarial prophylactic medication before her trip to India. Her physician recommends a specific drug as chloroquine resistance is widespread in that region. Which of the following is most effective in preventing malaria in this patient?

Ⓐ Atovaquone/proguanil

Ⓑ Mefloquine

Ⓒ Chloroquine

Ⓓ Doxycycline

Ⓔ Primaquine

**30.** A 15-year-old boy is brought to the physician for a routine examination. He has a history of recurrent nose bleeds and easy bruising but says that it's common in his family. Vital signs are within normal limits. Physical examination shows no abnormalities. Laboratory studies show:
Platelets: 275,000/mm3 (150,000-400,000/mm3)
Bleeding time: 9 mins (2-7 mins)
Clotting time: 17mins (8-15 mins)
PT: 12s (11-15 s)
aPTT: 42s (25-40s)
Which of the following is the most likely defective in this patient?

Ⓐ Sequestration of platelets in spleen

Ⓑ Increased consumption of coagulation factors

Ⓒ Decreased production of platelets

Ⓓ Defect in platelet adhesion

Ⓔ Increased vascular fragility

**31.** A 58-year-old man visits the physician complaining of weakness, fatigue and weight loss for the past six-months. He has lost approximately 10-kg during that with no significant change in activity level or diet. He states that he has been having increasing difficulty rising from a seated position or climbing stairs. He has a 25-pack-year smoking history. He coughs frequently during the examination but explains it’s just from his smoking. The physician suspects a paraneoplastic syndrome and orders a chest X-Ray which reveals multiple opacities in the left lung and biopsy confirms a diagnosis of small cell carcinoma. Which of the following mechanisms most likely explains this patient’s weakness?

Ⓐ Autoantibodies binding to postsynaptic ACh receptors

Ⓑ Inhibition of acetylcholinesterase in the synaptic cleft

Ⓒ Proteolytic degradation of presynaptic SNARE proteins

Ⓓ Autoantibodies binding to presynaptic voltage gated calcium channels

Ⓔ Proteolytic degradation of SNARE proteins in inhibitory interneurons

**32.** An 18-month-old child and her distraught parents present to the ED in December with their child who “isn’t breathing right.” On examination the child is wheezing, and rales are auscultated. The child’s parents describe her having a previous case of the ‘sniffles’ throughout the past week and in the last two days they have noticed the progressive wheezing. Vital signs are:

HR: 130 beats/minute
Respiratory Rate: 26/ minute
Temperature 38.2 degrees
Blood Pressure 110/80

Chest imaging shows inflammation of the bronchioles and small bronchi of the child. Which of the following best describes the most common cause of her symptoms?

- Ⓐ (+) naked ss RNA virus
- Ⓑ (+) enveloped ds DNA virus
- Ⓒ (-) enveloped ss RNA virus
- Ⓓ (-) naked ss DNA virus
- Ⓔ (+) enveloped ss RNA virus

**33.** A 20-year-old man comes to the emergency department due to a persistent cough productive of foul-smelling sputum and progressive dyspnea which onset 4 days ago. The patient has a history of recurrent respiratory tract infections since he was a child. There is no history of tobacco use. Temperature is 39°C (102.2°F), heart rate is 90/min, blood pressure is 120/82 mmHg, respiratory rate is 22/min, and oxygen saturation is 95% on room air. Auscultation of the lung shows expiratory wheezes bilaterally with reduced breath sounds and hyperresonance in the right lower lobe. Examination of upper extremities shows clubbing and peripheral cyanosis. Chest X-ray shows dextrocardia along with decreased vascular markings in the right lower lung field with interstitial inflammation near the region of the right lower lobar bronchus. Which of the following is the most likely cause of this patient’s dyspnea?

- Ⓐ Idiopathic pulmonary fibrosis
- Ⓑ Pulmonary hypertension
- Ⓒ Resorption atelectasis
- Ⓓ Lobar pneumonia
- Ⓔ Chronic bronchitis

**34.** 14. A 31-year-old man with Hodgkin lymphoma comes to the emergency department because of chest pain for the past 2 days. He has been receiving chemotherapy for Hodgkin's lymphoma for the last month.  An ECG shows nonspecific changes. An echocardiogram shows dilation of the left ventricle. A diagnosis of dilated cardiomyopathy is made. Which of the following could have been administered to prevent the development of cardiomyopathy in this patient?

Ⓐ Filgrastim
Ⓑ Mesna
Ⓒ Daunorubicin
Ⓓ Leucovorin
Ⓔ Dexrazoxane
Ⓕ Dexamethasone
Ⓖ Doxorubicin

**35.** A 42-year-old woman comes to the physician because of 2 episodes of loss of consciousness over the past week. She recovered immediately and was not confused following the episodes. During the past 5 months, she has also had increased shortness of breath and palpitations. She has been unable to carry out her daily activities. She also reports some chest tightness that resolves with rest. She has no history of serious illness and takes no medications. She immigrated with her family from India 10 years ago. Her temperature is 37.3°C (99.1°F), pulse is 115/min and irregular, and blood pressure is 108/70 mm Hg. Examination shows jugular venous distention and pitting edema below the knees. Which of the following is the most likely diagnosis

Ⓐ Mesothelioma
Ⓑ Idiopathic pulmonary hemosiderosis
Ⓒ Granulomatosis with polyangiitis
Ⓓ Pulmonary HTN
Ⓔ Lung abscess

**36.** A 30-year-old woman comes to the physician because of a 3-day history of dark urine in the mornings and progressive fatigue. Physical examination shows conjunctival pallor and hepatosplenomegaly. A CBC shows low hemoglobin, haptoglobin, and platelet count. Flow cytometry shows decreased levels of CD55 and CD59 on RBCs. Which of the following complications is most likely?

Ⓐ Iron overload
Ⓑ Deep vein thrombosis
Ⓒ Esophageal webs
Ⓓ Subacute combine degeneration
Ⓔ Amyloid deposition in kidney

**37.** A 34-year-old man comes to the physician because of progressive swelling of the left lower leg for 4 months. One year ago, he had an episode of intermittent fever and tender lymphadenopathy that occurred shortly after he returned from a trip to India and resolved spontaneously. Physical examination shows 4+ nonpitting edema of the left lower leg. His leukocyte count is 8,000/mm3 with 25% eosinophils. A blood smear obtained at night shows thin, slender, translucent thread like larvae with several nuclei. Treatment with diethylcarbamazine is initiated. Which of the following is the most likely route of transmission of the causal pathogen?

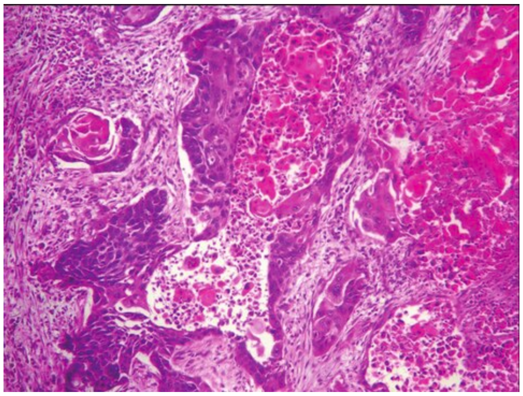
Ⓐ Cyst

Ⓑ Proglottid

Ⓒ Trophozoite

Ⓓ Microfilaria

Ⓔ Cercaria



**38.** A 69-year-old man comes to the physician because of a cough for the past 3 months. The cough is mostly dry, but the patient recalls a recent episode in which he coughed up mucus with dark red streaks. He has felt tired for the past few months. Over the past month, he has had poor appetite and a 5-kg (11-lb) weight loss. He also has occasional back pain, which has worsened in recent weeks. He has no recent travel history. He has smoked a pack of cigarettes daily for 30 years. He does not drink alcohol. His vitals are within normal limits. Auscultation of the lungs reveals wheezing in the lower right lung field. There is no peripheral lymphadenopathy. The liver is of normal size, and the spleen is not palpable. Laboratory studies show a hemoglobin concentration of 13.5 g/dL, serum calcium concentration of 12.3 mg/dL, and a total serum protein of 7.0 g/dL. X-rays of the chest are shown. Which of the following is the most likely complication?

Ⓐ Atelectasis

Ⓑ ARDS

Ⓒ Proximal muscle weakness

Ⓓ Hyponatermia

Ⓔ Hyperglycemia

**39.** A 5-year-old boy is brought to the emergency department because of a 2-week history of bone pain, increasing fatigue, fever and nose bleeds. His temperature is 38.8°C (102°F), blood pressure is 100/65 mm Hg, pulse is 122/min and respirations are 32/min. Physical examination shows pallor, petechial hemorrhage over the limbs and trunk and splenomegaly. Complete blood count shows leukocytosis and anemia. Examination of peripheral blood smear shows numerous blast cells. A bone marrow aspirate shows more than 20% of blast cells that stain positive for PAS positive and negative for myeloperoxidase. Which of the following is the most likely indicator of good prognosis in this condition?

Ⓐ 12;21 translocation

Ⓑ Thymus involvement

Ⓒ Age of 12

Ⓓ WBC >100,000

Ⓔ CD3+, CD4+

Ⓕ 8;14 translocation

**40.** 30-year-old man comes to the clinic because of a 1-week history history of progressive, productive cough and shortness of breath. He has recently traveled to Michigan and reports spending multiple nights camping outdoors. His temperature is 39°C (102.2°F), heart rate is 90 BPM, respiration rate is 17/min, and blood pressure is 118/78 mmHg. Physical examination shows diffuse crackles bilaterally on lung auscultation. Chest X-ray shows diffuse interstitial infiltrates. A sputum specimen is obtained and visualized with Giemsa stain which shows small, round organisms within macrophages. Which of the following is the most likely causative organism?

Ⓐ Blastomyces dermatidis

Ⓑ Histoplasma capsulatum

Ⓒ Pneumocystis jirovecii

Ⓓ Cryptococcus neoformans

Ⓔ Coccidiodes immitis

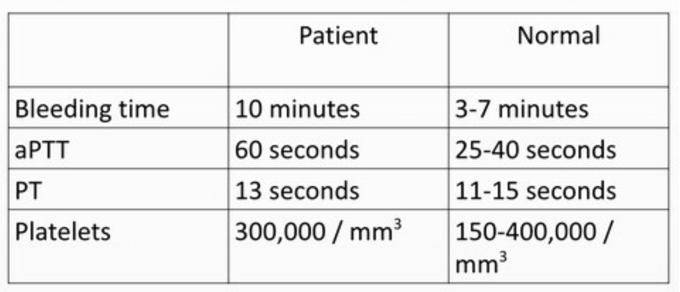
**41.** A 47-year-old woman is brought to the emergency department by her husband because of fever, headache, and increased confusion for the past week. Her temperature is 38.7C (102F), pulse is 96/min, respirations are 20/min, and blood pressure is 140/90 mmHg. She is disoriented to time and place. Examination shows jaundiced sclerae and skin, purpura on the trunk, and bleeding gums. Bladder catheterization reveals dark-colored urine and decreased urine output. Laboratory studies show:

Leukocyte count 8, 000/mm3
Hemoglobin 8 mg/dL
Hematocrit 24%
Platelet count 25, 000/mm3
Total bilirubin 2.5 mg/dL
Direct bilirubin 1.3 mg/dL
Lactate dehydrogenase 125 U/L
Creatinine 4.9 mg/dL

A peripheral blood smear shows schistocytes and helmet-shaped cells. Prothrombin time is 13 seconds, partial thromboplastin time is 36 seconds, and bleeding time is 10 minutes. Fibrin split products and Coombs tests are negative. Which of the following is the most likely diagnosis?

Ⓐ Autoimmune hemolytic anemia
Ⓑ Disseminated intravascular coagulation
Ⓒ Hemolytic uremic syndrome
Ⓓ Immune thrombocytopenic purpura
Ⓔ Thrombotic thrombocytopenic purpura

**42.**



| | Patient | Normal |
|---|---|---|
| Bleeding time | 10 minutes | 3-7 minutes |
| aPTT | 60 seconds | 25-40 seconds |
| PT | 13 seconds | 11-15 seconds |
| Platelets | 300,000 / $mm^3$ | 150-400,000 / $mm^3$ |

A 20-year-old man comes to the clinic with a referral from his dentist after excessive bleeding was observed during a routine tooth extraction one week ago. He experiences recurrent gingival bleeding after flossing and says he bruises easily. Vital signs are within normal limits and physical examination is unremarkable. A coagulation panel is ordered (results shown below). Which of the following intracellular compartments serves as a storage site for the enzyme deficient in this patient?

Ⓐ Weibel-Palade bodies
Ⓑ Platelet δ-granules
Ⓒ Macrophage Cytoplasm
Ⓓ Hepatocyte Golgi apparatus
Ⓔ Hepatocyte endoplasmic reticulum

**43.** A 4-year-old child and his parents present to their family physician with complaints of an “aggravating cough.” The child has had the cough for two days along with inspiratory stridor. His vital signs are as follows:

Temperature: 38 degrees
Respiratory Rate: 22/ minute
HR: 130 beats/minute (normal 80-120)
Blood Pressure: 110/80

Several of the child’s classmates in preschool have presented with similar symptoms. Which of the following proteins is involved in syncytia formation in this child?

Ⓐ G Glycoprotein
Ⓑ F protein
Ⓒ P/F proteins
Ⓓ L protein
Ⓔ M protein

**44.** A 20-year-old woman comes to the clinic because of a 6-month history of progressive fatigue and weakness. She switched to a strict vegan diet during her last year of high school and has found it difficult to balance her meals properly since she started college 2 years ago. She has no recent history of infection and denies any other symptoms. Physical examination shows conjunctival pallor, reduced sensation to light touch in all extremities, and 4/5 strength bilaterally with flexion and extension of the elbow joints. A peripheral blood smear shows macrocytes. This patient's neurological symptoms are most likely due to decreased activity of which of the following enzymes?

Ⓐ S-adenosylmethionine synthetase

Ⓑ Methionine synthase

Ⓒ Cystathione-β-synthase

Ⓓ Methylmalonyl-CoA mutase

Ⓔ Thymidylate synthase

**45.** A 14-year-old boy is brought to the physician by his mother because of fatigue and weight loss. Physical examination shows lymphadenopathy, hepatosplenomegaly and signs of anemia. He is diagnosed with acute lymphoblastic leukemia and started on methotrexate and 5-fluorouracil. Which of the following most likely describes the mechanism of action of these two chemotherapeutic agents?

Ⓐ They inhibit dihydrofolate reductase.

Ⓑ hey prevent microtube polymerization .

Ⓒ They decrease formation of thimidylate

Ⓓ They decrease levels of 6-thiouric acid

Ⓔ They inhibit RNA polymerase.

# Aug 2022 RHS Exam Review Part 1 Explanations

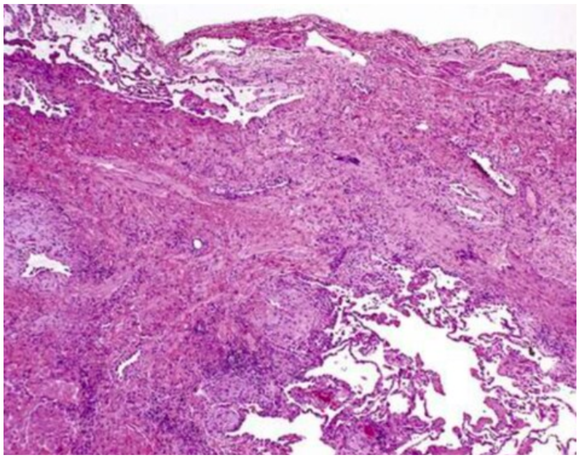
1. D
    - a. Cyclophosphamide
        - i. Hemorrhagic Cystitis ⍰ caused by acrolein
        - ii. Treat with Mesna
    - b. Cisplatin
        - i. Ototoxicity and Nephrotoxicity
            - 1. Nephrotoxicity is prevented by amifostine
                - a. Look for elevated renal lab values (elevated bun creatinine, the patient has signs of intrinsic renal failure)
    - c. Methotrexate
        - i. Inhibit the dihydrofolate reductase, decrease tetrahydrofolate
        - ii. AE: bone marrow suppression
            - 1. Filgrastim⍰ GMCSF analog/agonist
            - 2. Lecovorin⍰ Bone marrow rescue⍰ give folate to the other cells
    - d. Lecovorin
        - i. Supplement to protect the cells with methotrexate
    - e. Bleomycin
        - i. AE: Pulmonary fibrosis
    - f. Pacetaxel
        - i. AE: peripheral neuropathy and hypersensitivity
            - 1. Prevent the HSN with corticosteroids and H2 blockers
2. A
    - a. Direct Combs test positive⍰ AIHA
        - i. Types
            - 1. Cold ⍰ IgM
                - a. Mycoplasma Pneumonia
                - b. EBV
                - c. CLL
            - 2. Warm ⍰ IgG
                - a. CLL
                - b. SLE
                - c. Methyldopa
        - ii. Which AIHA is associated with an LRT Infection⍰ Mycoplasma Pneumonia ⍰ Cold agglutination
        - iii. Hemolytic Anemia Findings ⍰ lysis of the RBC
            - 1. Increase in the indirect bilirubin
                - a. Breakdown of the heme ⍰ hemosiderin⍰ bilirubin
            - 2. Decreased haptoglobin
                - a. Protein that binds heme the to prevent hemoglobinuria
            - 3. Increase in the LDH
                - a. Intracellular RBC enzyme
        - iv. What will I see on PBS with an AIHA?--> Spherocytes
    - b. Other answer choices
        - i. B⍰ extravascular hemolysis
        - ii. C⍰ NOT direct bilirubin is eleated
        - iii. D⍰ thalassemias and hairy cell leukemia
        - iv. E⍰ G6PD Deficiency
3. D

- a. Ground glass appearance in adult⍰ ARDS
  - i. Epigastric pain ⍰ stomach and pancreas
  - ii. Epigastric with alcoholic hx⍰ pancreas
    - 1. Patient most likely has pancreatitis caused by alcoholism
      - a. Epigastric pain that radiates to the back⍰ most specific pain distribution
  - iii. Histology⍰ Diffuse alveolar damage (DAD)
    - 1. Hyaline membrane formation!!!!!!!
- b. Causes ⍰ THINK ACUTE CAUSES
  - i. Sepsis
  - ii. Pancreatitis
  - iii. Drowning
  - iv. Oxygen Toxicity
  - v. Trauma
  - vi. Pneumonia
  - vii. Burns

4. A
   - a. Coryza/rhinorrhea (runny nose) and congestion and sore throat⍰ URT I caused by common cold
     - i. Adeno, rhino or corona virus
   - b. Answer choices
     - i. A⍰ +ssRNA enveloped (helical shape) ⍰ group 4
     - ii. B⍰ dsDNA virus, naked⍰ group 1
     - iii. C⍰ -ssRNA, enveloped, segmented ⍰ group 5
     - iv. D⍰ -ssRNA, enveloped⍰ group 5
     - v. E⍰ + ssRNA, naked ⍰ group 4
5. E
   - a. Ptosis, miosis, anhidrosis and mass in lung⍰ Horner Syndrome caused by Pancoast tumor
     - i. It is mass in the upper lobe affecting apex⍰ No paraneoplastic syndrome
       - 1. The cancer exerts a mass effect
   - b. Pancoast tumor⍰ compresses/invades/effects the :
     - i. autonomic ganglion⍰ horner syndrome
     - ii. Brachial plexus (C5-T1)⍰ arm pain, weakness, loss of sensation
     - iii. SVC⍰ SVC syndrome (upper limb and facial swelling)
   - c. Answer choices
     - i. A⍰ Horner syndrome
     - ii. B⍰ Carcinoid syndrome ⍰ release of serotonin
       - 1. Diarrhea, flushing, and bronchoconstriction/wheezing
     - iii. C⍰ SVC Syndrome
     - iv. D⍰ Squamous cell carcincoma
6. C
   - a. Preventation of microtubule polymerization⍰ halt the cell at metaphase Vinca Alkaloids
     - i. Vincristine ⍰ peripheral neuropathy
     - ii. Vinblastine⍰ bone marrow suppression
   - b. Answer choices

        i. A/B⍰ prevent depolymerization of the microtubule/promote polymerization⍰ halt the cell at anaphase
            1. AE: Peripheral neuropathy
        ii. D⍰ estrogen antagonist at the breast, agonist the uterus and bone
            1. Increased risk of endometrial cancer and can be used for osteoporosis (we don’t actually use for osteoporosis because the increase of endometrial cancer)
            2. Increased risk DVT and thrombi formation
        iii. E⍰ estrogen antagonist at the breast and the uterus and agonist bone
            1. USE FOR OSTEOPOROSIS
            2. NO RISK for endometrial cancer
            3. Increased risk of DVT and thrombi (less than tamoxifen)
        iv. F/G⍰ GnRH agonist⍰ initial increase in testosterone
            1. Prevented by giving flutamide (androgen receptor antagonist)

7. A
    a. Productive cough for 4 months for the past 3 years⍰ chronic bronchitis
    b. In order to diagnose chronic bronchitis it has to productive cough for at least 3 consecutive months for 2 consecutive years
        i. Histology findings
            1. Hyperplasia of the mucous glands⍰ increase reid index
                a. A normal reid index⍰ 40%
                b. With chronic bronchitis the reid index is >40% and closer to 50%
    c. Answer choices
        i. B⍰ emphysema
        ii. C⍰ ARDS
        iii. D⍰ UIP
        iv. E⍰ Asthma
8. D
    a. The image is showing both geographical and temporal heterogeneity-> UIP/IPF
        i. Terrible prognosis⍰ the only way to treat is with a lung transplant⍰ due relentless progress



9. A
    a. Have a patient coming with active TB symptoms and positive X-ray findings ⍰ RIPE Drugs for 2 months
        i. Isoniazid ⍰ converted into its active form via catalase-peroxidase (KatG gene) ⍰ stop the myocolic acid synthesis
            1. AE: peripheral neuropathy (caused Vit B6 deficiency, prvent by giving pyridoxine), hepatitis, CYP450 inhibitor
        ii. Rifampin⍰ Inhibits the DNA dependent RNA polymerase (rpoB gene)⍰ stop transcription
            1. AE: red orange bodily fluids, CYP450 activator
        iii. Pyrazinamide⍰ unclear

   1. Hyperuricemia and hepatotoxicity
      a. Nongouty polyarthralgia
iv. Ethmabutol⍰ Inhibit the arabinosyltransferase
   1. AE: red green color blindness

10. E
   a. Female with heavy periods and anemia⍰ Iron deficiency anemia
      i. Lab values
         1. Low MCV
         2. Decreased hemoglobin
         3. Low ferritin
         4. Increased TIBC
         5. Low Transferrin Saturation
            a. Serum iron/TIBC
      ii. Treat by giving iron
         **1. Ferrous iron/salt**
         **2. Iron salts**
         **3. Iron sucrose**
         **4. Iron Dextran**
   b. A⍰ megaloblastic anemia (Vit B9)⍰ alcoholics and pregnancy
   c. B⍰ megaloblastic anemia (Vit B12)⍰ crohns disease, pernicious anemia
   d. C⍰ Normocytotic anemia⍰ Chronic kidney disease
   e. D⍰ GMCSF analog agonist given to a patient with bone marrow suppression
   f. F⍰ given with Isoniazid to prevent peripheral neuropathy

11. A
   a. CORRECTION TO THE QUESTION STEM: A 66-year-old man comes to the emergency department because of a cough which started 2 days ago. He states that the cough is productive with rust colored sputum. An x-ray of the chest shows consolidation. A sputum culture shows positive growth of gram positive, catalase negative, **alpha-hemolytic cocci.** Which of the following virulence factors most likely contributes to the chronic carriage of the causal agent causing this patient's symptoms?
   b. A patient presenting with rust colored sputum⍰ S. pneumonia
      i. Gram positive diplococci, lancet shaped
      ii. Virulence factors
         1. Pneumolysin⍰ actually damage to the respiratory epithelium
         2. IgA protease⍰ break down the IgA⍰ it makes the epithelium more susceptible to damage
         3. Capsule⍰ anti phagocytic
         4. Biofilm⍰ evade the immune the response
         5. Leucocidin⍰ breaks down the WBC
   c. Answer choices
      i. B⍰ H. influenza⍰ epiglottis
      ii. C⍰ Klebsiella
         1. Associated with alcoholics and aspiration and abscess
         2. Look for red currant jelly sputum
      iii. D⍰ pseuodomonas
         1. Associated with CF and DM
            a. Grape like scent and blue green sputum
      iv. E⍰ S. Pyogenes
         1. Rheumatic fever

   2. PSGN
   3. Pharyngitis

12. C
  a. Picture sickle cells
  b. African American individual increased risk of developing sickle cell anemia
  c. HbS Sickle cell anemia
  d. Dactylitis pain in the hands and feet sickle cell anemia
  e. Pathogenesis
    i. Genetic mutation in the beta gene at position 6 that the amino acid from Glutamate valine
    ii. Causing a sticky site to form on the hemoglobin, leading to polymerization in the taut state/deoxygenated state sickle appearance
  f. Complications
    i. Femoral head necrosis
    ii. Autosplenectomy
      1. Howell jolly bodies
      2. Increased risk of infection by encapsulated SHiNS organism
        a. S. pneumonia, H. influenza, Neisseria, Salmonella
        b. Babesiosis
    iii. Renal papillary necrosis
    iv. Pigmented gallstones
      1. Increased indirect bilirubin
  g. Answer Choices
    i. A Hereditary spherocytosis
      1. Spectrin, ankyrin, protein 4.2, and band 3
    ii. B PNH
      1. Deficiency in CD55 and CD59 completed mediated hemolysis
    iii. D AIHA
    iv. E Alpha thalassemia

13. A
  a. African American patient with **bilateral hilar lymphadenopathy** sarcoidosis
    i. Symptoms of fever and night sweats make sure to rule out Tb
      **1. Look for a negative acid-fast test**
    ii. Histology noncaseating granulomas, schaumann bodies, asteroid bodies
      1. Schaumann bodies and asteroid bodies are also seen berylliosis
      2. Noncaseating granulomas bartonella Henselae (cat scratch disease)
    iii. Lab values
      1. Hypercalcemia increase 1 alpha hydroxylase activity of the epithelioid histocytes
        a. Activate Vit D increase calcium reabsorption
      2. Idiopathic increase in the ACE levels
  b. Answer choices
    i. B/D asthma
    ii. C squamous cell carcinoma
      1. Paraneoplastic syndrome PTHrP hypercalcemia
    iii. E UIP/IPF

14. C

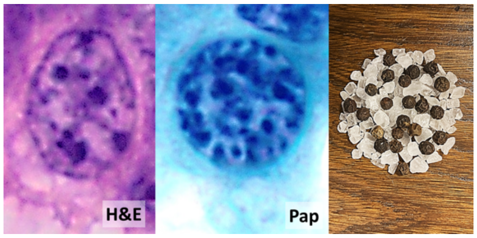
   a. Tear drop cells and **target cells** ⍰ thalassemia
      i. Patient who has a brother who was born with hydrops fetalis⍰ all 4 alpha genes deleted
   b. Answer choices
      i. A⍰ cis deletion of the alpha genes
      ii. B⍰ one gene deletion⍰ asymptomatic
      iii. C⍰ hydrops fetalis
         1. Gamma tetramers
      iv. D⍰ HbH disease (look the HbH on values)
         1. Beta tetramers
      v. E⍰ trans deletion of the alpha genes

15. E

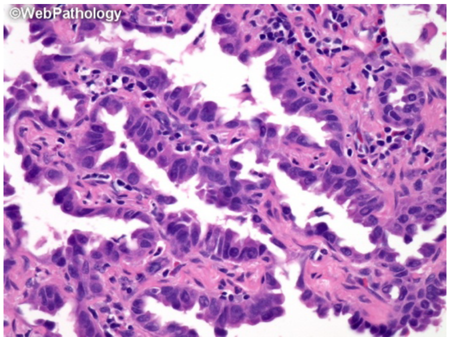
   a. Hx of SLE/autoimmune disease⍰ presenting with pallor and fatigue⍰ patient has anemia of chronic disease
      i. Lab values
         1. Decreased MCV
         2. Decreased Hb
         3. Decrease total serum iron
         4. Increased ferritin
            a. Hiding the storage form of the iron
         5. Decreased TIBC
            a. We do not want to go out and look for iron
         6. Increase hepcidin
            a. Inhibiting the ferroportin channel
   b. Answer Choice
      i. A⍰ Megaloblastic anemia
         1. Hypersegmented neutrophils
         2. Associated vegans, pernicious anemia
      ii. B⍰ hereditary spherocytosis
      iii. C⍰ Megaloblastic anemia
      iv. D⍰ Iron deficiency anemia

16. E

   a. Scanty cytoplasm and fine granular chromatin⍰ small round blue cells and the salt and pepper appearance⍰ small cell carcinoma/oat cell carcinoma
      i. Paraneoplastic syndromes
         1. Lambert eaton⍰ autoimmune attack on the presynaptic voltage gated calcium channels
         2. SIADH⍰ euvolemic hyponatremia
         3. ACTH⍰ cushing disease-->hyperglycemia, weight gain, purple striae



   b. Symptoms
      i. Proximal muscle weakness⍰ Lambert eaton syndrome
   c. Immunohistochemisty
      i. Synpatophysin and chromogranin positive



17. B

   a. Female non smoker and a lung mass⍰

adenocarcinoma of the lung
   - i. Lepidic pattern⍰ adenocarcinoma of the lung
- b. Mutations
   - i. EGFR mutation
   - ii. ALK mutation

18. D
- a. Breathing through pursed lipids, decreased FEV1: FVC ratio, RUQ pain ⍰ alpha 1 antitrypsin form⍰ panacinar emphysema
   - i. PiZZ mutation with buildup of the misfolded protein in the hepatocytes⍰ PAS positive granules/staining of the hepatocytes
- b. Centriacinar emphysema⍰ associated smoking
   - i. Affecting the upper lobes
   - ii. No liver involvement
- c. Pathogenesis
   - i. Imbalance between proteases and antiproteases

19. C
- a. IBD and intestinal resection⍰ Crohns disease
   - i. Resect the terminal ileum⍰ Vit B12 deficiency
      - 1. Vit b12 is reabsorped at the terminal ileum
- b. Vit B12 deficiency causing a megaloblastic anemia
   - i. Increase in the MCV
      - 1. Halt the cell in the S-phase so its bigger but not able to under go division due to the folate and or B12 deficiency
   - ii. Decrease in the Hb
   - iii. Increase in the homocysteine
   - iv. Increase in the methalmonic acid⍰ neurotoxic⍰ subacute combined degeneration
      - 1. Weakness and numbness and loss of vibration and proprioception of the lower extremities
- c. Answer choices
   - i. A⍰ Sickle cell anemia caused renal papillary necrosis
   - ii. B⍰ Plummer Vinson syndrome
      - 1. Esophageal webs
      - 2. IDA
      - 3. Glossitis
   - iii. D⍰ Sepsis and trauma and ARDS
   - iv. E⍰ hemolytic anemias

20. A
- a. GnRH agonist⍰ leuoprolide or Goserlin
   - i. Normally GnRH is released in pulses, so with an agonist⍰ you get a continuous release initially there will be an increase in the FSH and LH which will cause an increase in the testosterone
      - 1. So to prevent that initial increase give flutamide⍰ androgen receptor blocker

21. C
- a. Fever, headache malaise and cough for 3 weeks⍰ atypical pneumonia
   - i. When submerged in ice⍰ clumping⍰ cold agglutination
   - ii. The patient has mycoplasma pneumonia which lead to cold AIHA

b. Mycoplasma pneumonia HAS NO CELL WALL NO PEPTIDOGLYCAN
    i. DOES NOT GRAM STAIN!!!!!!!

22. F
  a. Cut and erythema and pain and swelling caused by a gram-positive cocci in clusters (staph aureus)  cellulitis
  b. Erysipelas fiery red appearance, well demarcated borders
      i. Strep pyogenes
  c. Answer choices
    d. A Shingles HHV-3
        i. Painful rash that affects one dermatome
    e. B coxsackie virus
    f. C C. Perfrinogens
        i. Co2 production crepitus
  g. D Staph aureus
  h. E Staph aureus
  i. Cumulative to keep in mind
      i. Endocarditis
          1. Prosthetic valve Staph epidermitis
              a. Gram positive cocci, catalase positive, coagulase negative, biofilm
          2. Dental work Strep viridins
              a. Gram positive cocci, alpha hemolytic, catalase negative, coagulase negative
          3. Colonscopy s. bovis
              a. Gram positive cocci, alpha hemolytic, catalase negative, coagulase negative
          4. Native valve/IVDU S. aureus
              a. Gram positive cocci, catalase positive, coagulase positive, beta hemolytic
      ii. I place Drug X in my eye and it causes no effect on the eyes
          1. But causes a decrease in BP and increase in the HR what was the drug
          2. Eyes have two receptors
              a. Alpha 1
              b. M3
          3. BP  vasculature
              ~~a. Alpha 1~~
              ~~b. M3~~
              c. Beta 2  vasodilation decrease in BP and reflex tachycardia
                  i. Isoproterenol

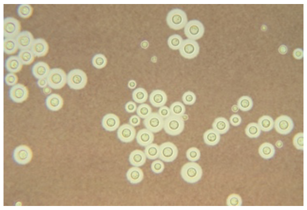
23. A
  a. Fever, cough, malaise, dyspnea pneumonia
      i. Pneumonia and diarrhea Legionella
          1. Silver stain positive
          2. BCYE agar
          3. Symptoms
              a. Pneumonia
              b. Diarrhea

c. Confusion/CNS symptoms
**d. HYPONATREMIA**
**4.** Diagnosis
**a. Urinary antigen test**

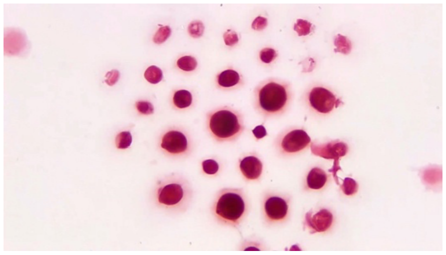
**24.** A
**a.** Sputum shows granule-containing cells⍰ crushmann spiral
**b.** Crystal masses⍰ charcot leyden crystals
**c.** Hx of Eczema⍰ Type 1 HSN (Th2 mediated response_
**i.** IL-4 ⍰ IgE
**ii.** IL-5⍰ eosinophils
**iii.** IL-10⍰ shut of the Th1
**iv.** Il-13⍰ call in the WBC and increase mucous production

25. D
a. Hypocellularity with fat predominance⍰ Aplastic anemia
i. Attack on all the cells in the bone marrow
1. Decreased RBC
2. Decreased platelet
3. Decreased WBC

26. A
a. Immunocompromised and have pneumonia
i. Asperigillosis
ii. PJP Pneumocystis jiroveci
iii. Cryptococcus
1. Diagnosis
a. India ink
b. Mucincarmine stain ⍰ red halo that forms



2. Presentation
a. Can lead meningitis in a patient⍰ nuchal rigidity, neck stiffness and pain
3. Virulence Factors
a. It is the only fungal organism that is encapsulated



27. C
a. Alzhemiers leads to global atrophy in the brain
i. AB amyloid deposition
ii. Pathogensis behind atrophy
1. Decreased protein synthesis
iii. Examples atrophy
1. Decreased use and nerve stimulation
a. Broken bone⍰ wearing cast
2. Decreased hormonal stimulation
a. Endocrine pathologies
b. Hypothyroidism
b. Answer choices
i. A/D⍰ irreversible cell damage
1. Calcium⍰ activate caspase, endonuclease, proteases
ii. B⍰ hypertrophy

      iii. E metaplasia
         1. Barrets esophgaus  intestinal metaplasia
         2. Smoking squamous metaplasia

28. E
   a. Patient waking up 4-5 times a week  moderate to severe asthma
      i. Long term treatment Low dose ICS + LABA or a medium dose ICS
   b. Answer choices
      i. A Oral form  do not give oral (treatment resistance asthma)
      ii. B pratropium SAMA
      iii. C Never give theophylline a lot of adverse affects
      iv. D LABA
         1. Never give a LABA alone because it can lead to status asthmatics

29. B
   a. Preggo who wants prophylaxis against chloroquine resistance
      i. Chloroquine sensitive area chloroquine
      ii. Chloroquine resistance mefloquine
   b. NEVER GIVE PRIMAQUINE to a preggo contraindicated
      i. Even if the patient is diagnosed vivax or ovale only treat with chloroquine or mefloquine until birth and then add the primaquine

30. D
   a. Increased bleeding time primary hemostatsis
   b. increase aPTT  problem with the common path/intrinsic pathway
   c. VwF adhere to the subenothelial collagen and the Gp1b receptor on the platelet platelet adhesion
   d. VwF also stabilizes factor 8 (is part of the intrinsic pathway)
   e. Answer choices
      i. A decreased platelet count and increase bleeding time normal PT and PTT time
         1. HIT (heparin induced thrombocytopenia) or ITP (immune thrombocytopenic purpura)
      ii. B DIC decreased platelet count, increase bleeding time, increase PT and PTT
      iii. C Aplastic anemia decreased platelet count and increase bleeding time normal PT and PTT time
      iv. E vasculitis  normal lab values all around in terms of hemostasis

31. D
   a. Small cell carcinoma and weakness lambert eaton syndrome autoimmune attack on the presynaptic voltage gated calcium channels
   b. Answer choices
      i. A MG  associated with a thymic neoplasia
      ii. B Indirect muscarinic agonist (neostigmines, physiostigimine)
      iii. C Botox
      iv. E Tetanus

32. C
   a. Baby with a respiratory infection/dyspnea RSV
      i. Intercostal retraction

        ii. Increased risk of developing in the asthma⍰ causes wheeszing
        iii. Organism
            1. Paramyo virus
                a. -ssRNA, enveloped
        iv. Virulence factors
            1. F protein⍰ syncytia formation

33. C
    a. Recurrent respiratory infection and. Dextrocardia⍰ Kartengener's syndrome
        i. Mutation in the dynenin arms of the cilia
        ii. Symptoms
            1. Situs inversus⍰ all the organs are on the opposite side
            2. Infertility
            3. Recurrent respiratory infections ⍰ at risk of developing bronchiectasis
                a. We see in the vignette there finger clubbing
                b. Bronchiectasis is the only obstructive disease that causes finger clubbing
                c. Complications bronchiectasis
                    i. Resorption/obstruction atelectasis
                        1. Caused by the A, B, C
                            a. A⍰ aspiration
                            b. B⍰ bronchitis, bronchiectasis bronchial asthma
                            c. C⍰ cancers

34. E
    a. Dilated cardiomyopathy⍰ caused by doxorubicin/daunorubicin (anthracyclines)
        i. MOA
            1. Topoisomerase II inhibitor
            2. Intercalates in the DNA and causes breaks
            3. ROS formation
            4. Alters membrane fluidity
        ii. AE:
            1. Dilated cardiomyopathy
                a. Prevent by giving dexarazone
        iii. Answer choices
            1. A⍰ Bone marrow suppression prevention
            2. B⍰ to prevent hemorrhagic cystitis caued by cyclophosphamide/ifosfamide
            3. D⍰ Potentiate 5FU or bone marrow rescue for methotrexate
            4. F⍰ prevent the HSN caused by pacetaxel

35. D
    a. Young female presenting with JVD and piting edema aka signs of RHF
        i. RHF is caused by cor pulmonale
            1. Patient most likely has primary Pulmonary HTN
                a. BMPR2 receptor mutation⍰ vasoconstriction of the pulmonary vasculature⍰ increase in the PVR
                    i. Increase in the vasoconstrictors⍰ endothelin, thromboxane A2

            ii. Decrease in the vasodilators⍰ NO and prostacyclin (PGI2)
        ii. Autopsy of the heart would show RV concentric hypertrophy

36. B
    a. Mutation causing decrease CD55 and CD59 levels⍰ PNH
        i. Mutaiotn in the PIGA gene causing destabilization of the GPI anchor⍰ decreased CD55 and CD59⍰ complement mediated hemolysis at nigh⍰ hemoglobinuria
        ii. Complications
            1. Thrombosis
                a. Budd Chiari Syndrome⍰ clot in the hepatic vein
                b. Stroke
                c. DVT
                d. PE
    b. Answer choices
        i. A⍰ Beta thalassemia due to the recurrent transfusions
            1. Bronze diabetes
        ii. C⍰ Plummer vinson syndrome
            1. IDA
            2. Esophageal webs
            3. Glossitis
        iii. D⍰ Vit B12 deficiency
            1. Hypersegmented neutrophils on PBS
            2. Increased methionine and methylmalonic acid
        iv. E⍰ chronic kidney disease⍰ EPO deficiency⍰ normocytic normochromic anemia

37. D
    a. Nonpitting edema in the lower extremity following travel⍰ Wucheria bancrofetti aka filariasis
        i. Pathogenesis
            1. Vector aka the aedes mosquito bites the host and injects the microfilarie in the blood
                a. The microfilarie to travel to the lymph mature into larvae and cause lymphatic obstruction⍰ nonpitting edema
    b. Answer choices
        i. C⍰ Diagnostic stage for malaria

38. A
    a. Correction to the question stem: A 69-year-old man comes to the physician because of a cough for the past 3 months. The cough is mostly dry, but the patient recalls a recent episode in which he coughed up mucus with dark red streaks. He has felt tired for the past few months. Over the past month, he has had poor appetite and a 5-kg (11-lb) weight loss. He also has occasional back pain, which has worsened in recent weeks. He has no recent travel history. He has smoked a pack of cigarettes daily for 30 years. He does not drink alcohol. His vitals are within normal limits. Auscultation of the lungs reveals wheezing in the lower right lung field. There is no peripheral lymphadenopathy. The liver is of normal size, and the spleen is not palpable. Laboratory studies show a hemoglobin concentration of 13.5 g/dL, serum calcium concentration of 12.3 mg/dL, and a total serum protein of 7.0 g/dL. **Biopsy findings are shown.**

Which of the following is the most likely complication?

- b. Lab value interpretation is showing hypercalcemia ⍰ sarcoidosis or squamous cell carcinoma of the lung
    - i. In the vignette⍰ weight loss in an elderly male and no lymphadenopathy⍰ rule in squamous cell carcinoma
- c. In the image⍰ keratin perals⍰ squamous cell carcinoma
- d. Complications
    - i. Resorption atelectasis
    - ii. Hypercalcemia caused by the PTHrP
- e. Answer choices
    - i. B⍰ acute causes, sepsis, drowning, pancreatis, burns
    - ii. C/D/E⍰ Small cell carcinoma (salt and pepper or the small round blue cells)

39. A
    - a. 20% blasts⍰ acute leukemia
        - i. Negative MPO⍰ it cannot be AML
        - ii. PAS positive⍰ ALL
    - b. The patient has ALL
        - i. B-ALL
            1. Boys
            2. Babies (younger patients)
            3. **Better prognosis**
            4. Metastasis to the ball (testes) and brain
            5. 12:21 translocation
        - ii. T-ALL
            1. Teenagers
            2. **Terrible prognosis**
            3. Increased WBC count >100,000
            4. Thymic involvement
            5. 9;22 translocation (blast crisis of the CML)

| **Good prognosis** | **Bad Prognosis** |
|---|---|
| B-cell ALL (Cd19, 20, 21) | T-cell ALL (Cd2-8) |
| WBC <100,000 | WBC >100,000 |
| 12;21 translocation | 9;22 translocation |
| Hyperploidy | Other ploidy |
| 2 <age>10 | Age >10 |

40. B
    - a. Small round organism in the macrophage⍰ histoplasmosis (SMALLEST)
        - i. Missipissi river and ohio river
    - b. Broad based budding yeast⍰ blastomycosis
        - i. Ohio river and midwest
    - c. Spherules⍰ Coccidiodes immitis (LARGEST)
        - i. SW America (California, Nevada, New Mexico)
41. E
    - a. Schistocytes on the PBS
        - i. Differentials
            1. **TTP** ⍰ caued by an ADAMST13 mutation
                - a. Fever
                - b. Seizure

- c. Thrombocytopenia
  - i. Decreaed platelet count
- d. MAHA ⍰ microangiopathic hemolytic anemia
  - i. Increaed LDH, increased indirect bilirubin, decreased haptoglobin
- e. Acute renal failure
  - i. Increased bun creatinine

2. **HUS⍰ caused by the ECOLI 0157:H7**
   - a. Thrombocytopenia
     - i. Decreaed platelet count
   - b. MAHA
     - i. Increaed LDH, increased indirect bilirubin, decreased haptoglobin
   - c. Acute renal failure
     - i. Increased bun creatinine
   - **d.** Bloody diarrhea following consumption of undercooked beef
3. **DIC ⍰ associated with sepsis AFE, trauma**
   - **a.** Decreased platelets, increased PT and PTT time, increaed d-dimer, and increased fibrin break (d-dimers)
4. HELLP syndrome
5. Mechnial valve injury

42. A
    - a. Increased bleeding time⍰ primary hemostatsis
    - b. increase aPTT ⍰ problem with the common path/intrinsic pathway
    - c. VwF⍰ adhere to the subenothelial collagen and the Gp1b receptor on the platelet⍰ platelet adhesion
    - d. VwF also stabilizes factor 8 (is part of the intrinsic pathway)
    - e. vWf is stored in the Weibel palade bodies along with the P-selectin
      - i. these bodies are found in the endothelial cells
43. B
    - a. Child with respitatory symptoms⍰ RSV
      - i. Presentation
        1. Croup⍰ laryngeotracheobronchitis
           - a. Instriptory stridor
           - b. Barking cough
           - c. Steeple sign on X-ray
           - d. Intercostal retractions
      - ii. Organism
        1. -ssRNA virus enveloped
      - iii. Virulence factors
        1. F protein
44. D
    - a. Vegan who presents with macrocytes⍰ Megaloblastic anemia caused by a Vit b12 deficiency
      - i. Increase in the MCV
      - ii. Decreased Hb
      - iii. Increased homocysteine

        1. Deficiency in the methionine synthase enzyme
    iv. Increase methylmalonic acid ⍰ neurotoxic causing the subacute combined degeneration
        1. Deficiency in the methylmalonyl-coA-mutase

45. C
    a. Methotrexate⍰ inhibit the dihydrofolate reductase⍰ decreased folate⍰ decrease formation of the DNA base pairs⍰ Adenine, guanine and thymidine
    b. 5FU⍰ inhibition of the thymidylate synthase⍰ decrease thymidine synthesis

# *Respiratory & Hematopoietic Systems Module*

***Robbins Essential Pathology (1st ed)***

***Chapter 9: Hematopoietic & Lymphoid Systems***

## ***Hematopathology Practice Questions***

**LECTURE 13: RBC DISORDERS 1 .......... - 1 -**

Question #1 .......... - 1 -
Question #3 .......... - 1 -
Question #21 .......... - 1 -

**LECTURE 15: RBC DISORDERS 2 .......... - 2 -**

Question #4 .......... - 2 -
Question #5 .......... - 2 -
Question #6 .......... - 2 -
Question #7 .......... - 3 -
Question #8 .......... - 3 -
Question #9 .......... - 3 -
Question #10 .......... - 4 -
Question #11 .......... - 4 -

**LECTURE 17: RBC DISORDERS 3 .......... - 5 -**

Question #12 .......... - 5 -
Question #13 .......... - 5 -
Question #15 .......... - 5 -
Question #16 .......... - 6 -
Question #17 .......... - 6 -
Question #18 .......... - 6 -

**LECTURE 19: WBC DISORDERS 1 .......... - 7 -**

Question #29 .......... - 7 -
Question #31 .......... - 7 -

**LECTURE 21: WBC DISORDERS 2 .......... - 8 -**

Question #32 .......... - 8 -
Question #35 .......... - 8 -
Question #36 .......... - 8 -
Question #37 .......... - 9 -
Question #38 .......... - 9 -
Question #39 .......... - 10 -
Question #43 .......... - 10 -

**LECTURE 23: WBC DISORDERS 3 .......... - 11 -**

Question #40 .......... - 11 -
Question #42 .......... - 11 -
Question #44 .......... - 12 -
Question #46 .......... - 12 -

**LECTURE 25: WBC DISORDERS 4 .......... - 13 -**

Question #30 .......... - 13 -
Question #48 .......... - 13 -
Question #49 .......... - 14 -
Question #52 .......... - 14 -

**DLA 06: BLEEDING DISORDERS .......... - 15 -**

Question #20 .......... - 15 -
Question #23 .......... - 15 -
Question #25 .......... - 15 -

**ANSWERS .......... - 16 -**

# Lecture 13: RBC Disorders 1

## Question #1

A healthy 19-year-old woman experienced blunt abdominal trauma in a motor vehicle accident. On admission to the hospital, her initial hematocrit was 33% (36-46%), but over the next hour, it decreased to 28%. She was taken to surgery, where a liver laceration was repaired & 1 L of bloody fluid was removed from the peritoneal cavity. She remained stable. A complete blood count (CBC) performed 7 days later is most likely to show which of the following morphologic findings in the peripheral blood?

A. Basophilic stippling of red cells
B. Hypochromic red cells
C. Leukoerythroblastosis
D. Reticulocytosis
E. Schistocytosis

**Question #1 → Ans**

## Question #3

A 28-year-old woman has had easy fatigability since childhood. On physical examination, she is febrile & has a pulse of 80 beats/min, respirations of 15 breaths/min & blood pressure of 110/70 mmHg. The spleen tip is palpable, but there is no abdominal pain or tenderness. Laboratory studies show hemoglobin of 11.7 g/dL (12.0-16.0 g/dL), platelet count of 159,000/$mm^3$ (150,000-400,000/$mm^3$) & WBC count of 5,390/$mm^3$ (4,500-11,000/$mm^3$). The peripheral blood smear shows a predominant population of round red cells that lack a zone of central pallor mixed with a smaller but readily noticeable population of larger red cells with a bluish tinge. An inherited abnormality in which of the following red blood cell (RBC) components best accounts for these findings?

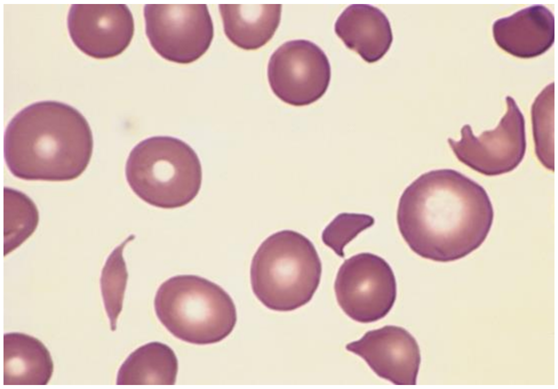
A. α-Globin chain
B. β-Globin chain
C. Glucose-6-phosphate dehydrogenase
D. Heme porphyrin ring
E. Spectrin

**Question #3 → Ans**

## Question #21

A 60-year-old man has had pain & burning on urination for the past week. On physical examination, he is febrile & has a pulse of 92 beats/min, respirations of 18 breaths/min & blood pressure of 80/45 mmHg. Digital rectal examination indicates that he has an enlarged, tender prostate. There is costovertebral angle tenderness on the right. Scattered ecchymoses are present over the trunk & extremities. Laboratory studies show a blood culture positive for *Klebsiella pneumonia*. The appearance of the RBCs in a peripheral blood smear is shown in the figure. Which of the following disorders is the most likely cause of the morphologic changes in RBCs?

A. Autoimmune hemolytic anemia
B. Hereditary spherocytosis
C. Iron deficiency anemia
D. Megaloblastic anemia
E. Microangiopathic hemolytic anemia

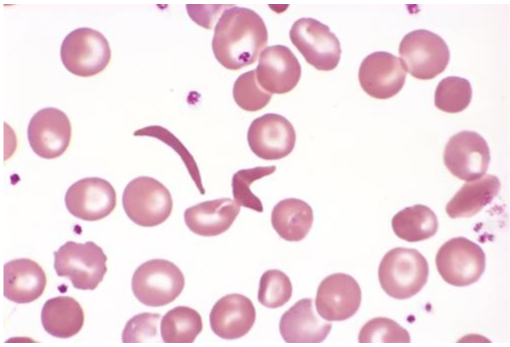


**Question #21 → Ans**

# Lecture 15: RBC Disorders 2

## Question #4

A 13-year-old boy has a sudden onset of severe abdominal pain & cramping accompanied by chest pain, nonproductive cough & fever. On physical examination, his temperature is 39°C, pulse is 110 bpm, respirations are 22 breaths/min & blood pressure is 80/50 mmHg. Laboratory studies show a hematocrit of 18% (36-50%). The peripheral blood smear is shown in the figure. A chest radiograph shows bilateral pulmonary infiltrates. Which of the following is the most likely mechanism for initiation of his pulmonary problems?



A. Chronic hypoxia of the pulmonary parenchyma
B. Parvovirus B19 infection
C. Obstruction of small vessels
D. Formation of autoantibodies to alveolar basement membrane
E. Intravascular antibody-induced hemolysis

**Question #4 → Ans**

## Question #5

A 28-year-old woman with a history of low-grade fever, rash & arthralgias for the past week presents with pallor & lethargy. She has a history of chronic anemia & spherocytes are observed on a peripheral blood smear. Her hematocrit, which normally ranges from 35% to 38%, is now 24% & the reticulocyte count is very low. The serum bilirubin level is 1.9 mg/dL (0.1-1.0 mg/dL). Which of the following events is most likely to have occurred in this patient?

A. Accelerated extravascular hemolysis in the spleen
B. Development of anti-RBC antibodies
C. Disseminated intravascular coagulation
D. Parvovirus B19 infection of erythroblasts
E. Superimposed dietary iron deficiency

**Question #5 → Ans**

## Question #6

A 3-year-old boy has a poor appetite & is underweight for his age & height. Physical examination shows hepatosplenomegaly. The hemoglobin concentration is 6 g/dL (10.5-13.5 g/dL) & the peripheral blood smear shows severely hypochromic & microcytic RBCs. The total serum iron level is normal & reticulocyte count is 5% (0.5-1.5%). A radiograph of the skull shows maxillofacial deformities & expanded marrow spaces. Which of the following is the most likely cause of this child's illness?

A. Imbalance in α-globin & β-globin chain production
B. Increased susceptibility to oxidative stress
C. Reduced synthesis of hemoglobin F
D. Relative deficiency of vitamin $B_{12}$
E. Impaired utilization of iron by erythroblasts

**Question #6 → Ans**

## Question #7

A 13-year-old boy has experienced multiple episodes of pneumonia & meningitis since infancy. Two of the episodes of infection were accompanied by sepsis. Causative organisms include *Streptococcus pneumonia* & *Haemophilus influenzae*. On physical examination, the child has no organomegaly, but the cheekbones are prominent. Laboratory studies show hemoglobin of 9.2 g/dL (12.0-16.0 g/dL), hematocrit of 27.8% (36-50%), platelet count of 372,000/mm$^3$ (150,000-400,000/mm$^3$) & WBC count of 10,300/mm$^3$ (3,200-9,800/mm$^3$). A hemoglobin electrophoresis shows 2% hemoglobin $A_2$ (1.5-3.1%) & 92% hemoglobin S. Which of the following is the most likely cause of the repeated infections in this patient?

A. Reduced endothelial cell expression of adhesion molecules
B. Diminished hepatic synthesis of complement proteins
C. Impaired neutrophil production
D. Impaired splenic function
E. Reduced synthesis of immunoglobulins

**Question #7 → Ans**

## Question #8

A 14-year-old girl has had a history of fatigue & weakness for her entire life. She has not undergone puberty. She has hepatosplenomegaly. CBC shows hemoglobin of 9.1 g/dL (12.0-16.0 g/dL), hematocrit of 26.7% (36-50%), MCV of 66 μm$^3$ (78-98 μm$^3$), platelet count of 150,000/mm$^3$ (150,000-400,000/mm$^3$) & WBC count of 3,670/mm$^3$ (3,200-9,800/mm$^3$). Special stains reveal aggregates of α-globin in normoblasts. Which of the following derangements is the most likely cause of anemia in this patient?

A. Sequestration of iron in bone marrow macrophages
B. Apoptosis of erythroid progenitors
C. Reduced absorption of dietary iron
D. Reduced secretion of erythropoietin
E. Sensitivity of red cells to complement-mediated lysis

**Question #8 → Ans**

## Question #9

A 12-year-old boy has a history of episodes of severe abdominal, chest & back pain since early childhood. On physical examination, he is febrile & there is no organomegaly. Laboratory studies show hemoglobin of 10.2 g/dL (11.4-15.5), platelet count of 194,000/mm$^3$ (150,000-400,000/mm$^3$) & WBC count of 9,020/mm$^3$ (3,800-12,700/mm$^3$). The peripheral blood smear shows sickled red cells & occasional nucleated RBCs. Hemoglobin electrophoresis shows 1% hemoglobin $A_2$ & 93% hemoglobin S. Hydroxyurea therapy is found to be beneficial in this patient. An increase in which of the following is the most likely basis for its therapeutic efficacy?

A. Erythrocyte production
B. Overall globin chain synthesis
C. Oxygen affinity of hemoglobin
D. Production of hemoglobin A
E. Production of hemoglobin F

**Question #9 → Ans**

## Question #10

A 25-year-old woman has a 3-year history of arthralgias. Physical examination shows no joint deformity, but she appears slightly pale. Laboratory studies show total RBC count of 4.7 million/mm$^3$ (3.5-5.5 million/mm$^3$), hemoglobin of 12.5 g/dL (12.0-16.0 g/dL), hematocrit of 37.1% (36-46%), platelet count of 217,000/mm$^3$ (150,000-400,000/mm$^3$) & WBC count of 5890/mm$^3$ (4,500-11,000/mm$^3$). Peripheral blood smear shows hypochromic & microcytic RBCs. Total serum iron & ferritin levels are normal. Hemoglobin electrophoresis shows 93% hemoglobin $A_1$ with elevated hemoglobin $A_2$ level of 5.8% & hemoglobin F level of 1.2%. Which of the following is the most likely diagnosis?

A. Anemia of chronic disease
B. Autoimmune hemolytic anemia
C. β-Thalassemia minor
D. Infection with Plasmodium vivax
E. Iron deficiency anemia

**Question #10 → Ans**

## Question #11

A 23-year-old man passes dark, reddish-brown urine 3 days after recovery from a viral pneumonia. On physical examination, he is febrile & there are no remarkable findings. Complete blood count (CBC) shows a mild normocytic anemia, but the peripheral blood smear shows precipitates of denatured globin (Heinz bodies) with supravital staining & scattered “bite cells” in the population of RBCs. Serum haptoglobin level is reduced. Which of the following is the most likely mechanism of anemia?

A. RBC injury by unpaired β-globin chains
B. Oxidant injury to RBCs
C. RBC sensitivity to complement due to lack of complement regulatory proteins
D. Appearance of anti-RBC antibodies in the setting of viral infection
E. Relative folate deficiency caused by viral infection

**Question #11 → Ans**

# Lecture 17: RBC Disorders 3

## Question #12

A 34-year-old woman reports becoming increasingly tired for the past 5 months. On physical examination, she is febrile & has mild splenomegaly. Laboratory studies show a hemoglobin concentration of 10.7 g/dL (12.0-16.0 g/dL) & hematocrit of 32.3% (36-46%). Peripheral blood smear shows spherocytes & rare nucleated RBCs. Direct Coombs test results are positive. Which of the following underlying diseases is most likely to be diagnosed in this patient?

A. Escherichia coli septicemia
B. Hereditary spherocytosis
C. Infectious mononucleosis
D. Mycoplasma pneumoniae infection
E. Systemic lupus erythematosus

**Question #12 → Ans**

## Question #13

An infant is born at 34 weeks of gestation to a 28-year-old woman, G3, P2. At birth, the infant is markedly hydropic & icteric. A cord blood sample is taken & the direct Coombs test on the infant's RBCs is positive. Which of the following is the most likely mechanism for the findings in this infant?

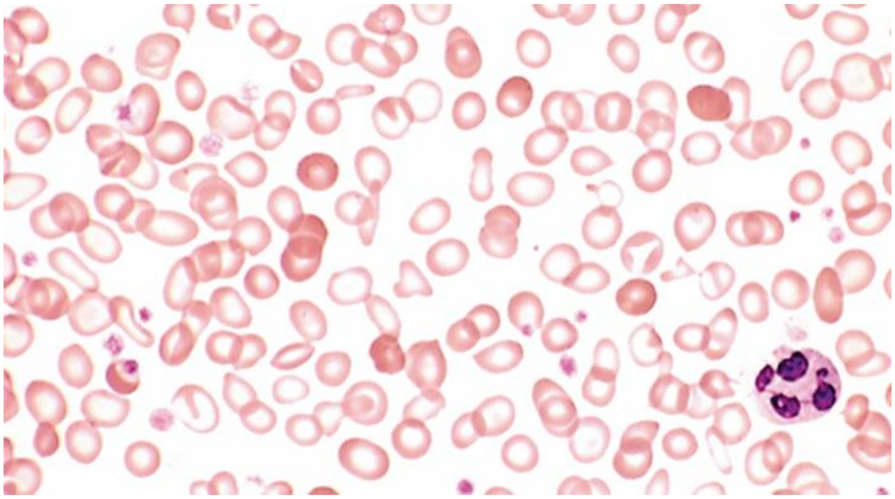
A. Hemolysis of antibody-coated cells
B. Hematopoietic stem cell defect
C. Impaired globin synthesis
D. Mechanical fragmentation of RBCs
E. Oxidative injury to hemoglobin

**Question #13 → Ans**

## Question #15

A 73-year-old man takes no medications & has had no prior major illnesses or surgeries. For the past year, he has become increasingly tired & listless. CBC shows hemoglobin 9.7 g/dL (13.5-17.5. g/dL); hematocrit 29.9% (41-53%); MCV 69.7 mm$^3$ (80-100 μm$^3$); RBC count 4.28 million/mm$^3$ (4.3-5.9 million/mm$^3$); platelet count 331,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 5,500/mm$^3$ (4,500-11,000/mm$^3$). His peripheral blood smear is shown in the figure. Measuring the serum level of which of the following is likely to be most useful in arriving at the diagnosis?

A. Vitamin B$_{12}$
B. Ascorbic acid
C. Ferritin
D. C-reactive protein
E. Transferrin



**Question #15 → Ans**

## Question #16

A 59-year-old man has experienced chronic fatigue & weight loss for the past 3 months. There are no remarkable findings on physical examination. Laboratory studies show hemoglobin 10.0 g/dL (13.5-17.5. g/dL); hematocrit 30.3%; MCV 81 μm$^3$ (80-100 μm$^3$); platelet count 240,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 7,550/mm$^3$ (4,500-11,000/mm$^3$); serum iron 20 μg/dL (30-60 μg/dL); total iron-binding capacity (transferrin level) 145 μg/dL (240-450 μg/dL); serum ferritin 565 ng/mL (12-150 ng/mL). Serum erythropoietin levels are low for the level of hemoglobin. Which of the following is the most likely mechanism of anemia?

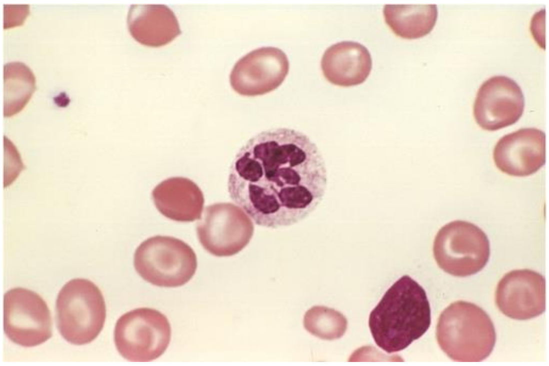
A. Increased synthesis of hepcidin in the liver
B. Chronic blood loss
C. Decrease in intake of heme iron
D. An increase in the level of ferroportin
E. Reduced synthesis of IL-6 in the liver?

**Question #16 → Ans**

## Question #17

A 62-year-old man is taken to the emergency department in a state of inebriation. He is well known there because this scenario has been repeated many times over 15 years. On physical examination, he is febrile. The spleen is enlarged & the liver biopsy shows alcoholic cirrhosis. Laboratory studies show hemoglobin 8.2 g/dL (13.5-17.5 g/dL); hematocrit 25.1% (41-53%); MCV 117 μm$^3$ (80-100 μm$^3$); platelet count of 135,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 3,920/mm$^3$ (4,500-11,000/mm$^3$). The peripheral blood smear is illustrated in the figure. Which of the following is the most likely to explain the anemia in this patient?

A. Impaired DNA synthesis
B. Extravascular hemolysis of antibody-coated cells
C. Imbalance in synthesis of α-globin & β-globin chains
D. Increased susceptibility to lysis by complement
E. Reduced deformability of RBC membranes



**Question #17 → Ans**

## Question #18

A 37-year-old woman has experienced abdominal pain & intermittent low-volume diarrhea for the past 3 months. On physical examination, she is febrile. A stool sample is positive for occult blood. A colonoscopy is performed & biopsy specimens from terminal ileum & colon show microscopic findings consistent with Crohn disease. She doesn't respond to medical therapy & part of colon & terminal ileum are removed. She is transfused with 2 units of packed RBCs during surgery. Three months later, she appears healthy, but states that she is easily fatigued. CBC findings show hemoglobin 10.6 g/dL (12.0-16.0 g/dL); hematocrit 31.6% (36-46%); RBC count 2.69 million/mm$^3$ (3.5-5.5 million/mm$^3$); MCV 118 μm$^3$ (80-100 μm$^3$); platelet count 178,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 4,800/mm$^3$ (4,500-11,000/mm$^3$). Hypersegmented neutrophils were seen in the blood smear. The reticulocyte count is 0.3% (0.5-1.5%). Which of the following is most likely to produce these hematologic findings?

A. Anemia of chronic disease
B. Chronic blood loss
C. Hemolytic anemia
D. Aplastic anemia
E. Vitamin $B_{12}$ deficiency

**Question #18 → Ans**

# Lecture 19: WBC Disorders 1

## Question #29

A 26-year-old man has a 10-week history of fever with nonproductive cough. On examination, temperature is 37.4°C. A chest radiograph shows a 4-cm left upper lobe nodule. CBC shows hemoglobin 13.3 g/dL (13.5-17.5. g/dL); hematocrit 40.5% (41-53%); platelet count 281,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 13,760/mm$^3$ (4,500-11,000/mm$^3$) with 38% segmented neutrophils, 2% bands, 45% lymphocytes & 15% monocytes. What is the most likely diagnosis?

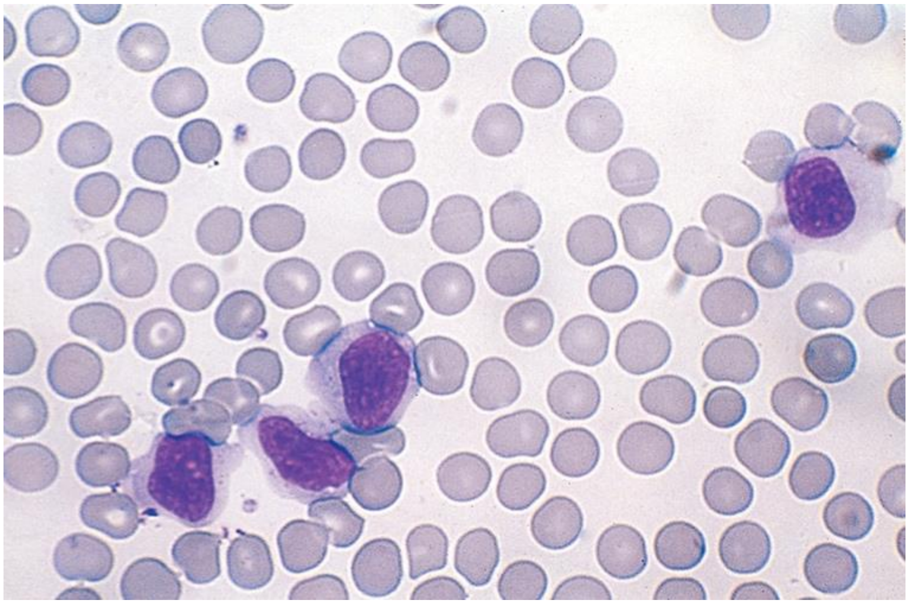
A. Acute lymphoblastic leukemia
B. Chronic lymphocytic leukemia
C. *Mycobacterium tuberculosis* infection
D. Myelodysplastic syndrome
E. *Staphylococcus aureus* abscess

**Question #29 → Ans**

## Question #31

A 23-year-old, previously healthy man has experienced malaise, low-grade fever & sore throat for 2 weeks. On physical examination, his temperature is 37.6° C & he has pharyngeal erythema without exudation. There is tender cervical, axillary & inguinal lymphadenopathy. Laboratory studies show hemoglobin 12.2 g/dL (13.5-17.5 g/dL); hematocrit 36.6% (41-53%); platelet count 190,200/mm$^3$ (150,000-400,000/mm$^3$); WBC count 8,940/ mm$^3$ (4,500-11,000/mm$^3$. His peripheral blood smear is shown in the figure. Based on these findings & a laboratory test result, his doctor advises against any antibiotic treatment & he recovers after 6 weeks. What is the most important mechanism of recovery in this case?

A. Activation of cytotoxic T cell response
B. Activation of the complement cascade
C. Activation of macrophages
D. Production of neutralizing antibodies
E. Activation of B cells



**Question #31 → Ans**

# Lecture 21: WBC Disorders 2

## Question #32

A 14-year-old boy has had chest discomfort that has worsened over the past 5 days. On physical examination, he has generalized lymphadenopathy. A chest radiograph shows clear lung fields, but there is widening of the mediastinum. A chest CT scan shows a 10-cm mass in the anterior mediastinum. A biopsy specimen of the mass is obtained & microscopically shows sheets of immature lymphoid cells. The cells express terminal deoxynucleotidyl transferase (TdT), CD2, CD3 & CD7. What is the most likely clinical course of tumors of this type?

A. The majority of such cases are cured by chemotherapy
B. Median survival is less than one year with chemotherapy
C. It has an indolent course
D. Treatment with drugs that kill HTLV-1 virus is curative
E. Skin is preferentially involved in untreated cases

**Question #32 → Ans**

## Question #35

A 66-year-old man has noted an increasing number & size of "lumps" over the past 5 months. On examination, there is firm, nontender inguinal, axillary & cervical lymphadenopathy. A biopsy specimen of a cervical lymph node shows nodular aggregates of small, cleaved lymphoid cells & larger cells with open nuclear chromatin, several nucleoli & moderate amounts of cytoplasm. A bone marrow biopsy specimen shows lymphoid aggregates of similar cells that express surface immunoglobulins & are CD10+ & CD5-. Karyotyping of these lymphoid cells indicates the presence of t(14;18). What is the most likely molecular characteristic of this disease?

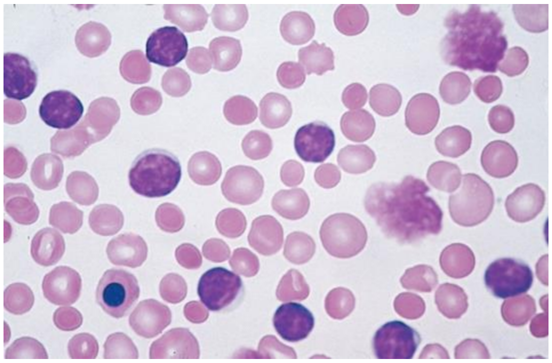
A. Overexpression of MYC causing rapid growth
B. Overexpression of BCL2 causing resistance to apoptosis
C. Expression of *BCR-ABL* resulting in constitutive activation of a tyrosine kinase
D. Reduced levels of functional antibodies, leading to susceptibility to infections
E. Overexpression of cyclin D1 causing impaired G1-S transition of cell cycle

**Question #35 → Ans**

## Question #36

A 60-year-old woman presents for a routine check-up. On physical examination, she had palpable nontender axillary & inguinal lymph nodes & the spleen tip was palpable. Laboratory studies showed hemoglobin 13.1 g/dL (12.0-16.0 g/dL); hematocrit 38.5% (36-46%); MCV 90 μm$^3$ (80-100 μm$^3$); platelet count 189,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 31,300/mm$^3$ (4,500-11,000/mm$^3$). The peripheral blood smear is shown in the figure. Which of the following clinical features is typical of this disease?

A. Selective involvement of the skin
B. Prolonged survival even without treatment
C. Death caused by blast crisis
D. Bone marrow involvement is uncommon
E. Excessive antibody production leading to hyperviscosity syndrome



**Question #36 → Ans**

## Question #37

A 37-year-old man infected with HIV for the past 10 years who has not been taking his antiretroviral therapy is admitted to the hospital with abdominal pain of 3 days duration. Physical examination shows abdominal distention & absent bowel sounds. An abdominal CT scan shows a mass lesion involving the ileum. He undergoes surgery to remove an area of obstruction in the ileum. Gross examination of the specimen shows a firm, tan mass, 10 cm long & 3 cm in greatest depth, that has infiltrated through the wall of the ileum. Histologic studies show a mitotically active population of CD19+ lymphoid cells with prominent nuclei & nucleoli. Molecular analysis is most likely to show which of the following viral genomes in the lymphoid cells?

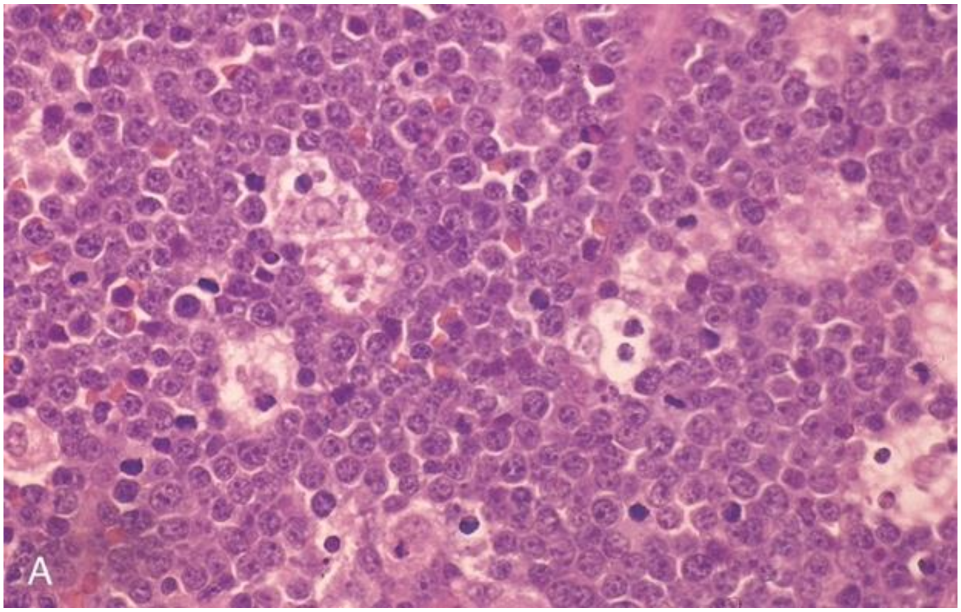
A. Cytomegalovirus
B. Epstein-Barr virus
C. HIV
D. Human herpesvirus 8
E. Human T-cell lymphotropic virus type 1

**Question #37 → Ans**

## Question #38

A 12-year-old boy has had increasing abdominal distention & pain for the past 3 days. Physical examination of his abdomen shows lower abdominal tenderness with tympany & reduced bowel sounds. An abdominal CT scan shows a 7-cm mass involving the region of the ileocecal valve. Surgery is performed & the resected mass microscopically shows sheets of intermediate-sized lymphoid cells, with nuclei having coarse chromatin, several nucleoli & many mitotic figures. This cell population is absent in a bone marrow biopsy sample. Cytogenetic analysis of the cells from the mass shows a t(8;14) karyotype. Flow cytometric analysis reveals 40% of the cells are in S phase. The tumor shrinks dramatically after a course of chemotherapy. Dysregulation of which of the following genes is most likely to be involved in the pathogenesis of this disease?

A. *BCL6*
B. *MYC*
C. *CCND1* (gene encoding cyclin D1)
D. *JAK2*
E. *BCR-ABL*



**Question #38 → Ans**

## Question #39

A 55-year-old man felt a lump near his shoulder 1 week ago. On physical examination, there is an enlarged, nontender, supraclavicular lymph node & enlargement of the Waldeyer ring of oropharyngeal lymphoid tissue. There is no hepatosplenomegaly. CBC is normal except for findings of mild anemia. A lymph node biopsy specimen shows replacement by a monomorphous population of lymphoid cells that are twice the size of normal lymphocytes, with enlarged nuclei & prominent nucleoli. Immunohistochemical staining & flow cytometry of the node indicates that most lymphoid cells are CD19+, CD10+, CD3-, CD15- & terminal deoxynucleotidyl transferase negative (TdT-). A *BCL6* gene mutation is present. Complete remission is achieved with intensive chemotherapy. Which of the following is the most likely diagnosis?

A. Acute lymphoblastic lymphoma
B. Burkitt lymphoma
C. Diffuse large B-cell lymphoma
D. Hodgkin lymphoma
E. Small lymphocytic lymphoma

**Question #39 → Ans**

## Question #43

A 54-year-old woman has a 7-month history of nausea with vomiting & early satiety. On physical examination, she is afebrile & has no lymphadenopathy or hepatosplenomegaly. CBC shows hemoglobin 12.9 g/dL (12.0-16.0 g/dL); hematocrit 41.9% (36-46%); platelet count 263,000/mm$^3$ (150,000-400,000/mm$^3$); WBC count 8,430/mm$^3$ (4,500-11,000/mm$^3$). An upper gastrointestinal endoscopy shows loss of the rugal folds of the stomach over a 4 × 8 cm area of the fundus. Gastric biopsy specimens reveal the presence of *Helicobacter pylori* organisms in the mucus overlying superficial epithelial cells. There are extensive mucosal & submucosal monomorphous infiltrates of small lymphocytes, which are CD19+ & CD20+, but CD5−. After treatment of the *H. pylori* infection, her condition improves. Which of the following effects of *H. pylori* is most likely involved in proliferation of B cells in such a case?

A. Inactivation of RB by *H. pylori*-encoded proteins
B. Inactivation of p53 function by *H. pylori*-encoded proteins
C. Inflammatory cytokines secreted by *H. pylori*-specific T cells
D. Mutagenic effect of *H. pylori* on helper T cells
E. Accelerated telomere shortening by *H. pylori* infection

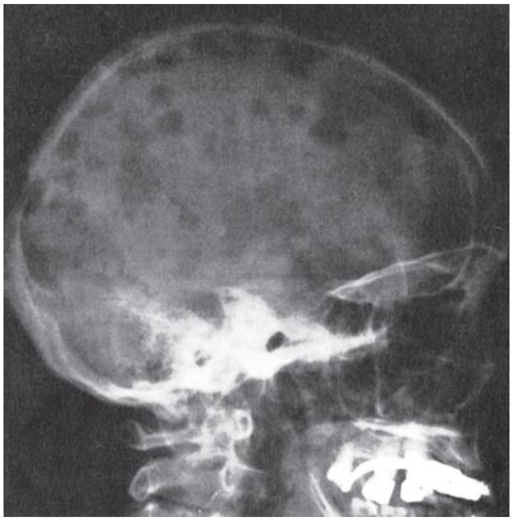
**Question #43 → Ans**

# Lecture 23: WBC Disorders 3

## Question #40

A 61-year-old man reports back pain for 5 months. He has recently developed a cough that is productive of yellow sputum. On physical examination, he is febrile & diffuse rales are heard on auscultation of the lungs. He has no lymphadenopathy or splenomegaly. Laboratory studies include a sputum culture that grows *Streptococcus pneumoniae*. The serum creatinine level is 3.7 mg/dL (0.6-1.2 mg/dL) & the urea nitrogen level is 45 mg/dL (7-18 mg/dL). The figure shows a skull radiograph. A bone marrow biopsy specimen from this man is most likely to show increased numbers of which of the following?

A. Myeloblasts
B. Small mature lymphocytes
C. Plasma cells
D. Reed-Sternberg cells
E. Lymphoblasts

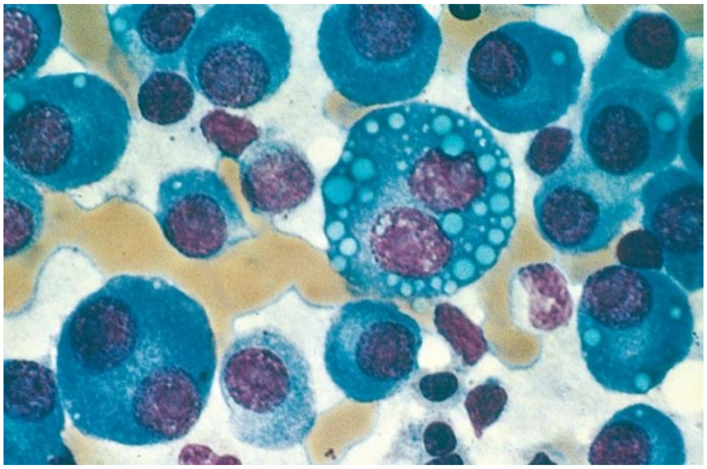


**Question #40 → Ans**

## Question #42

A 69-year-old woman presents with a 1-month history of increasing back pain. On physical examination, there is tenderness over the lower back, but no kyphosis or scoliosis. A radiograph of the spine shows a partial collapse of T10 & multiple 0.5- to 1.5-cm lytic lesions with a rounded soap-bubble appearance in the thoracic and lumbar vertebrae. A bone marrow biopsy is performed, and a smear of the aspirate is shown in the figure. Which of the following laboratory findings is most likely to be seen in this patient?

A. Bence Jones proteins in the urine
B. Decreased serum alkaline phosphatase level
C. Hypogammaglobulinemia
D. Platelet count of 750,000/mm$^3$ (150,000-400,000/mm$^3$)
E. WBC count of 394,000/mm$^3$ (4,500-11,000/mm$^3$)



**Question #42 → Ans**

## Question #44

A 53-year-old man has experienced several bouts of pneumonia over the past year. He now reports of vague abdominal pain & a dragging sensation. Physical examination shows splenomegaly. CBC shows hemoglobin 9.2 g/dL (13.5-17.5. g/dL); hematocrit 27.6% (41-53%); MCV 90 $\mu m^3$ (80-100 $\mu m^3$); platelet count 63,000/$mm^3$ (150,000-400,000/$mm^3$); WBC count 2,400/$mm^3$ (4,500-11,000/$mm^3$). A chest radiograph shows patchy infiltrates & a culture of sputum grows *Mycobacterium kansasii*. Molecular testing reveals the presence of *BRAF* mutation. Which of the following findings is most characteristic of this disorder?

A. Cytoplasmic Auer rods in myeloid cells
B. Lymphocytes with fine projections from the cytoplasm
C. Monoclonal IgG in serum
D. t(9:22) translocation in stem cells
E. Cytoplasmic toxic granulations in neutrophils

**Question #44 → Ans**

## Question #46

A 26-year-old man has noted lumps in his neck that have been enlarging for the past 6 months. On physical examination, he has a group of enlarged, nontender, right cervical lymph nodes. A biopsy of one of the lymph nodes microscopically shows macrophages, lymphocytes, neutrophils, eosinophils & a few plasma cells. There are scattered CD15+ large cells with multiple nuclei or a single nucleus with multiple nuclear lobes, each with a large inclusion-like nucleolus. What is the most likely cell of origin & infectious agent within these large cells?

A. B lymphocyte, Epstein-Barr virus (EBV)
B. CD4+ cell, human T lymphotropic virus-1
C. Endothelial cell, human herpesvirus-8
D. Macrophages, human immunodeficiency virus
E. Natural killer (NK) cell, cytomegalovirus

**Question #46 → Ans**

# Lecture 25: WBC Disorders 4

## Question #30

A 36-year-old woman has a 1-week history of cough & fever. On physical examination, her temperature is 38.3° C. She has diffuse crackles in all lung fields. A chest radiograph shows extensive bilateral infiltrates. CBC shows hemoglobin 13.9 g/dL (12.0-16.0 g/dL); hematocrit 42% (36-46%); MCV 89 $\mu m^3$ (80-100 $\mu m^3$); platelet count 350,000/$mm^3$ (150,000-400,000/$mm^3$); WBC count, 56,000/$mm^3$ (4,500-11,000/$mm^3$), with 63% segmented neutrophils, 16% bands, 7% metamyelocytes,3% myelocytes, 1% blasts, 8% lymphocytes & 2% monocytes. A bone marrow biopsy is obtained & shows increased numbers of myeloid cells that show left-shifted, but normal, maturation. Karyotype performed on the bone marrow aspirate shows a normal female karyotype (46, XX). Which of the following is the most likely diagnosis?

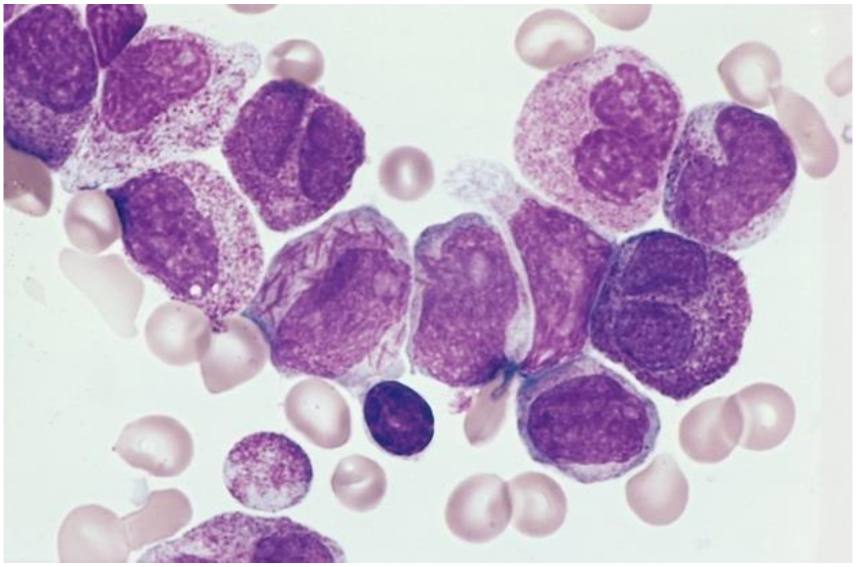
A. Chronic myeloid leukemia
B. Polycythemia vera
C. Hodgkin lymphoma, lymphocyte depletion type
D. Leukemoid reaction
E. Myelodysplastic syndrome

**Question #30 → Ans**

## Question #48

A 38-year-old man experiences sudden onset of a severe headache. Physical examination shows no localizing neurologic signs & no organomegaly. A stool sample is positive for occult blood. Areas of purpura appear on the skin of his extremities. Laboratory studies show hemoglobin 9.6 g/dL (13.5-17.5. g/dL), hematocrit 28.9% (41-53%), platelet count 16,400/$mm^3$ (150,000-400,000/$mm^3$); WBC count of 13,000/$mm^3$ (4,500-11,000/$mm^3$). The peripheral blood smear has the appearance shown in the figure; schistocytes also are seen. The plasma D-dimer level (fibrin degradation products), prothrombin time & partial thromboplastin time all are elevated. Cytogenetic analysis of cells from a bone marrow biopsy specimen is most likely to yield what karyotypic abnormality?

A. t(8;14)
B. t(8;21)
C. t(9;22)
D. t(14;18)
E. t(15;17)

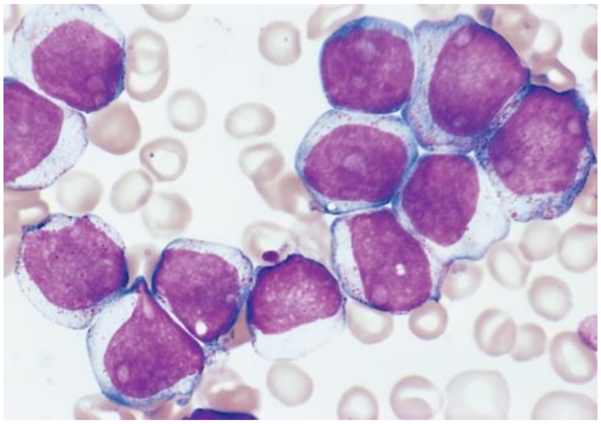


**Question #48 → Ans**

## Question #49

A 22-year-old university student reports a 2-month history of easy fatigability. On physical examination, she has neither hepatosplenomegaly nor lymphadenopathy. Mucosal gingival hemorrhages are noted. CBC shows hemoglobin 9.5 g/dL (12.0-16.0 g/dL); hematocrit 28.2% (36-46%); MCV 94 $\mu m^3$ (80-100 $\mu m^3$); platelet count 20,000/$mm^3$ (150,000-400,000/$mm^3$); WBC count 107,000/$mm^3$ (4,500–11,000/$mm^3$). Her peripheral blood smear is shown in the figure & these cells contain peroxidase-positive granules. A bone marrow biopsy specimen shows 100% cellularity with few residual normal hematopoietic cells. Which of the following is the most likely diagnosis?

A. Acute lymphoblastic leukemia
B. Acute myeloid leukemia
C. Chronic lymphocytic leukemia
D. Chronic myeloid leukemia
E. Hodgkin lymphoma



**Question #49 → Ans**

## Question #52

A 66-year-old man has experienced fatigue, a 5-kg weight loss, night sweats & abdominal discomfort for 10 months. On physical examination, he has marked splenomegaly; there is no lymphadenopathy. Laboratory studies show hemoglobin 10.1 g/dL (13.5-17.5. g/dL); hematocrit 30.5% (41-53%); MCV 89 $\mu m^3$ (80-100 $\mu m^3$); platelet count 94,000/$mm^3$ (150,000-400,000/mm3); WBC count 14,750/$mm^3$ (4,500-11,000/$mm^3$), with 55% segmented neutrophils, 9% bands, 20% lymphocytes, 8% monocytes, 4% metamyelocytes, 3% myelocytes, 1% eosinophils & 2 nucleated RBCs per 100 WBCs. A bone marrow biopsy specimen shows extensive marrow fibrosis & clusters of atypical megakaryocytes. Which of the following is most likely to account for the enlargement in this patient's spleen?

A. Extramedullary hematopoiesis
B. Granulomas with Histoplasma capsulatum
C. Hodgkin lymphoma
D. Metastatic adenocarcinoma
E. Portal hypertension

**Question #52 → Ans**

# DLA 06: Bleeding Disorders

## Question #20

A 23-year-old woman in her 25th week of pregnancy has felt no fetal movement for the past 3 days. Three weeks later, she still has not given birth & suddenly develops dyspnea with cyanosis. On physical examination, her temperature is 37° C, pulse is 106 beats/min, respirations are 23 breaths/min & blood pressure is 80/40 mmHg. She has large ecchymoses over the skin of her entire body. A stool sample is positive for occult blood. Laboratory studies show an elevated prothrombin time & partial thromboplastin time. The platelet count is decreased, plasma fibrinogen is markedly decreased & fibrin split products are detected. A blood culture is negative. Which of the following is the most likely cause of her bleeding diathesis?

A. Consumption of coagulation factors
B. Defects in platelet aggregation
C. Increased vascular fragility
D. Reduced production of platelets
E. Toxic injury to the endothelium

**Question #20 → Ans**

## Question #23

A 56-year-old woman experiences the sudden onset of headache and photophobia & her condition worsens for the next 2 days. On physical examination, she has a temperature of 38° C & is disoriented. CBC shows hemoglobin 11.2 g/dL (12.0-16.0 g/dL); hematocrit 33.7% (36-46%); MCV 94 $\mu m^3$ (80-100 $\mu m^3$); platelet count 32,000/$mm^3$ (150,000-400,000/$mm^3$); WBC count 9,900/$mm^3$ (4,500-11,000/$mm^3$). The peripheral blood smear shows schistocytes. The PT & PTT are normal. The serum urea nitrogen level is 38 mg/dL (7-18 mg/dL) & the creatinine level is 3.9 mg/dL (0.6-1.2 mg/dL). Which of the following is the most likely diagnosis?

A. Autoimmune hemolytic anemia
B. Disseminated intravascular coagulation
C. Idiopathic thrombocytopenic purpura
D. Paroxysmal nocturnal hemoglobinuria
E. Thrombotic thrombocytopenic purpura

**Question #23 → Ans**

## Question #25

A 42-year-old woman has had nosebleeds, easy bruising & increased bleeding with her menstrual periods for the past 4 months. On physical examination, her temperature is 37° C, pulse is 88/min & blood pressure is 90/60 mmHg. She has scattered petechiae over the distal extremities. There is no organomegaly. Laboratory studies show hemoglobin 12.3 g/dL (12.0-16.0 g/dL); hematocrit 37% (36-46%); platelet count 11,500/$mm^3$ (150,000-400,000/$mm^3$); WBC count of 7,370/$mm^3$ (4,500-11,000/$mm^3$). A bone marrow biopsy specimen shows a moderate increase in megakaryocytes. The prothrombin & partial thromboplastin times are within the reference range. What is the most likely cause of bleeding?

A. Disseminated intravascular coagulation
B. Destruction of IgG-coated platelets by the spleen
C. Autoantibodies against ADAMTS13
D. Defective production of platelets in the bone marrow
E. Defects in platelet aggregation

**Question #25 → Ans**

# Answers

## Question #1 → Ans

**D. RETICULOCYTOSIS** → Anemia due to acute, severe bleeding decreases oxygen delivery to the kidney, resulting in hypoxia that is "sensed" by interstitial cells near the proximal renal tubules. Hypoxia stabilizes the transcription factor HIF (hypoxia-inducible factor), which upregulates production & secretion of the hormone erythropoietin. This in turn increases the proliferation & survival of red cell progenitors in the bone marrow, resulting in increased production of red cells & consequent increase in the frequency of newly formed red cells (reticulocytes) in the peripheral blood in 5 to 7 days.

**Incorrect answers:**

A. Basophilic stippling of red cells is a finding that can be seen in a variety of disorders marked by disturbed hemoglobin production, including thalassemia & lead poisoning.

B. Hypochromic red cells are indicative of inadequate hemoglobin production & are most commonly seen with iron deficiency & thalassemia; red cells produced in response to acute blood loss have normal amounts of hemoglobin & are hence called normochromic.

C. Leukoerythroblastosis refers to the presence of immature erythroid & myeloid elements in the peripheral blood & is usually caused by marrow fibrosis, which can be induced by metastatic cancer, granulomatous disease, or certain blood cancers.

E. Schistocytosis refers to red blood cell fragments that are produced by high shear stresses, usually due to intravascular thrombosis, as may occur in disseminated intravascular coagulation (DIC), hemolytic uremic syndrome (HUS), or thrombotic thrombocytopenia purpura (TTP)

## Question #3 → Ans

**E. SPECTRIN** → The lifelong symptomatology, mild anemia, splenomegaly & presence of spherocytes (round red cells that lack a central zone of pallor) in the blood are all consistent with hereditary spherocytosis (HS), an autosomal dominant disorder caused by defects in the red blood cell membrane skeleton. Several different components of the membrane skeleton may be mutated in HS, but the common feature is that they all lead to a deficiency of spectrin, the major red cell membrane protein, which destabilizes the lipid bilayer, causing red cells to lose membrane as they age & become spherocytic. Spherocytic red cells have decreased deformability & are unable to squeeze through the fenestrae in the spleen that separate the red pulp from the splenic sinusoids. As a result, they become trapped & are removed by phagocytes, a form of extravascular hemolysis.

**Incorrect answers:**

A. Defects of α-globin chains are most commonly associated with α-thalassemia, a disorder of ineffective red cell production. Thalassemia is associated with microcytic red cells, target cells & other abnormally shaped red cells; it does not result in spherocytes. The larger red cells with a bluish tinge are consistent with reticulocytes, suggesting that this patient has a disorder of red cell destruction rather than production.

B. Defects of β-globin chains are most commonly associated with β-thalassemia, a disorder of ineffective red cell production. Thalassemia is associated with microcytic red cells, target cells & other abnormally shaped red cells; it does not result in spherocytes. The larger red cells with a bluish tinge are consistent with reticulocytes, suggesting that this patient has a disorder of red cell destruction rather than production.

C. Glucose-6-phosphate dehydrogenase deficiency is associated with periodic red blood cell hemolysis following infections or exposure to oxidant drugs or certain foods. It is X-linked & rarely occurs in women.

D. Heme porphyrin ring defects are associated with porphyria or inherited sideroblastic anemia. Porphyria usually presents with findings related to skin abnormalities or neural dysfunction, whereas sideroblastic anemia is an underproduction anemia that would not be associated with reticulocytosis. Viral pneumonia can also lead to hyaline membrane formation, but in the absence of fever & cough viral pneumonia is highly unlikely.

## Question #21 → Ans

**E. MICROANGIOPATHIC HEMOLYTIC ANEMIA** → The patient has developed urosepsis & the presence of schistocytes (red cell fragments) in the peripheral blood smear is consistent with disseminated intravascular coagulation (DIC) accompanied by microangiopathic hemolytic anemia. Schistocytes form when red cells pass through areas of turbulent blood flow, which in this setting is caused by deposition of small thrombi in the microvasculature throughout the body. Ecchymoses are caused by consumption of platelets in DIC & severe thrombocytopenia.

**Incorrect answers:**

A. Autoimmune hemolytic anemia is associated with formation of spherocytes, which are not seen in the peripheral blood smear.

B. Hereditary spherocytosis is associated with the presence of spherocytes, which are not seen in the peripheral blood smear.

C. Iron deficiency anemia is associated with the presence of microcytic hypochromic cells & various numbers of elongated "pencil" cells, neither of which is seen in the peripheral blood smear.

D. Megaloblastic anemia is associated with macro-ovalocytes & hypersegmented neutrophils, neither of which is seen in the peripheral blood smear.

## Question #4 → Ans

**C. OBSTRUCTION OF SMALL VESSELS** → The clinical scenario is consistent with sickle cell disease complicated by acute chest syndrome, in which sickle cells adhere to & obstruct small vessels in the lung. This in turn sets in motion a vicious cycle in which obstruction of pulmonary vessels causes increasingly severe hypoxia, further exacerbating sickling & vascular obstruction. Treatment often consists of exchange transfusion, in which sickle red cells are replaced with normal red cells.

**Incorrect answers:**

A. Chronic hypoxia of the pulmonary parenchyma is inconsistent with the clinical story of acute onset symptoms.

B. Parvovirus B19 infection of erythroblasts can occur in sickle cell anemia; it is associated with aplastic crisis & rapid worsening of anemia, not pain or pulmonary infiltrates.

D. Formation of autoantibodies to alveolar basement membrane is associated with Goodpasture syndrome, which may produce radiologic changes in the lungs; patients have hemoptysis & usually do not have severe anemia.

E. Intravascular antibody-induced hemolysis would be associated with hemoglobinuria & would not produce the observed pulmonary findings.

## Question #5 → Ans

**D. PARVOVIRUS B19 INFECTION OF ERYTHROBLASTS** → Patients with chronic hemolytic anemias such as hereditary spherocytosis are at high risk for developing rapidly worsening anemia when infected with parvovirus B19. This virus selectively infects red cell progenitors in the marrow, producing a transient red cell aplasia until the host immune response clears the virus. This transient aplasia is of little consequence in individuals in whom red cells have a normal lifespan (120 days) but produces rapidly worsening anemia in individuals in whom the red cell life span is decreased due to hemolysis.

**Incorrect answers:**

A. Accelerated extravascular hemolysis in the spleen due to some other disorder that increases the size of the spleen, such as infectious mononucleosis, might decrease the hematocrit by increasing red cell destruction, but the reticulocyte count would continue to be high.

B. Development of anti-RBC antibodies would decrease the hematocrit by increasing red cell destruction, but the reticulocyte count would continue to be high.

C. Disseminated intravascular coagulation would decrease the hematocrit by increasing red cell destruction, but the reticulocyte count would continue to be high.

E. Superimposed dietary iron deficiency might suppress hematopoiesis & decrease the hematocrit, but not to the degree seen with parvovirus infection, in which erythropoiesis comes to a virtually complete stop.

## Question #6 → Ans

**A. IMBALANCE IN α-GLOBIN & β-GLOBIN CHAIN PRODUCTION** → The findings are consistent with a severe form of thalassemia, which is prevalent in Mediterranean countries. In this part of the world, β-thalassemia predominates & is usually caused by point mutations that interfere with the production of β-globin chains. In the absence of β-globin chains, unpaired α-globin chains precipitate in red cell precursors & cause apoptosis. Chronic tissue hypoxia stunts growth & severe chronic anemia & resultant high levels of erythropoietin drive the expansion of immature red cell progenitors, which distort bones & "spread" to extramedullary sites, such as the liver & spleen, which are enlarged due to extramedullary hematopoiesis. Note that while the relative reticulocyte count is high, the absolute reticulocyte count is low for the severity of the anemia.

**Incorrect answers:**

B. Increased susceptibility to oxidative stress occurs in glucose-6-phosphatase-dehydrogenase deficiency because, in the absence of this enzyme, there is impaired production of reduced glutathione, which protects against oxidant stress triggered by ingestion of certain drugs or by infections.

C. Hemoglobin F levels in β-thalassemia tend to be normal or even increased, possibly because cells with residual fetal hemoglobin have a survival advantage

D. Relative deficiency of vitamin $B_{12}$ does not contribute to the severity of anemia in β-thalassemia, whereas relative deficiency of folate (which is marginally present in many diets) may worsen the anemia.

E. Impaired utilization of iron by erythroblasts is a feature of the anemia of chronic inflammation, not thalassemia.

## Question #7 → Ans

**D. IMPAIRED SPLENIC FUNCTION** → The hemoglobin electrophoresis results indicate that this child has sickle cell anemia (elevated HbS, normal Hb A2). In this disease, sickling of red cells leads to autoinfarction of the spleen, which even before infarction is dysfunctional due to chronic congestion. The spleen, by acting as filter for the blood & a source of antibodies, is particularly important in protecting against infections by encapsulated organisms such as *H. influenza* & *S. pneumoniae*.

**Incorrect answers:**

A. In sickle cell anemia, endothelial cell expression of adhesion molecules tends to be increased, not decreased.

B. Diminished hepatic synthesis of complement proteins is not a feature of sickle cell anemia.

C. Neutrophil production is normal in patients with sickle cell anemia.

E. Sickle cell anemia does not directly affect synthesis of immunoglobulins, although loss of the spleen (a site of antibody production) may indirectly impair B-cell responses to antigens.

## Question #8 → Ans

**B. APOPTOSIS OF ERYTHROID PROGENITORS** → The findings are consistent with β-thalassemia, in which defects in β-globin production lead to unpaired α-globin chains, which form aggregates in red cell progenitors. These aggregates generate oxidative stress & also induce the unfolded protein response, both of which may contribute to death by the mitochondrial (intrinsic) pathway of apoptosis.

**Incorrect answers:**

A. Sequestration of iron in bone marrow macrophages is a feature of the anemia of chronic inflammation. It is caused by increased level of hepcidin.

C. Reduced absorption of dietary iron is also a feature of the anemia of chronic inflammation, whereas iron uptake is increased in thalassemia due to suppression of hepcidin production in the liver.

D. Erythropoietin production is increased in thalassemia due to renal hypoxia.

E. Sensitivity of red cells to complement-mediated lysis is a feature of paroxysmal nocturnal hemoglobinuria, a rare, acquired condition in which red cells are produced without certain surface proteins that protect cells from complement.

## Question #9 → Ans

**E. PRODUCTION OF HEMOGLOBIN F** → Hydroxyurea is a mild chemotherapeutic agent that decreases the frequency of pain crises & improves the anemia in sickle cell disease through several mechanisms. One is by increasing the production of hemoglobin F (fetal hemoglobin), which interferes with the self-association of HbS & inhibits sickling. Other proposed mechanisms include decreasing the WBC count (which may have anti-inflammatory effects) & increasing the level of nitric oxide, which may oppose vasoocclusion due to its vasodilator effects.

**Incorrect answers:**

A. Erythrocyte production in sickle cell disease is increased to compensate for the red cell depletion due to hemolysis.

B. Overall globin chain synthesis is normal in sickle cell disease.

C. Sickle hemoglobin has a normal affinity for oxygen. HbF has a somewhat higher affinity for hemoglobin than adult hemoglobin, but this does not have a significant effect on delivery of oxygen to tissues.

D. Production of hemoglobin A is not possible in patients with two HbS alleles without corrective gene therapy.

## Question #10 → Ans

**C. β-THALASSEMIA MINOR** → The only common cause of increased HbA2 is β-thalassemia. HbA2 is a minor hemoglobin that consists of two alpha chains & two delta chains; the latter are encoded by the delta globin locus, which is located near the β-globin locus on chromosome 11. When the expression of beta chains is decreased, as in β-thalassemia minor (also known as β-thalassemia trait), the delta chains compete more effectively for pairing with alpha chains, increasing the concentration of HbA2.

**Incorrect answers:**

A. Anemia of chronic disease is not associated with elevated HbA2; red cells may be on the small end of normal but are usually not microcytic & hypochromic.

B. Autoimmune hemolytic anemia causes increased erythropoiesis but there is no change in the production of β-globin chains.

D. Infection with *Plasmodium vivax* also would be associated with red cell hemolysis & normal or increased red cell size (due to reticulocytosis); organisms might also be seen within red cells.

E. Although iron deficiency anemia is also associated with hypochromic & microcytic red cells, normal serum iron & ferritin levels exclude iron deficiency.

## Question #11 → Ans

**B. OXIDANT INJURY TO RBCs** → The clinical scenario & laboratory findings are classic for glucose-6-phosphate dehydrogenase (G6PD) deficiency, an X-linked trait most often seen in individuals of African, Asian, & Middle Eastern descent. G6PD is needed for synthesis of glutathione, which scavenges oxygen-derived free radicals & protects red cells from oxidant stress, as may be induced by infections & certain drugs & foods. When exposed to oxidants, cells that are G6PD deficient are prone to hemoglobin denaturation, membrane damage & both intravascular & extravascular hemolysis. Splenic macrophages attempt to pluck out Heinz bodies & in the process cause red cell membrane damage, resulting in the formation of "bite cells".

**Incorrect answers:**

A. Red cell injury by unpaired β-globin chains is a feature of α-thalassemia, a chronic disorder that does not produce intravascular hemolysis.

C. RBC sensitivity to complement due to lack of complement regulatory proteins leading to intravascular hemolysis is a feature of paroxysmal nocturnal hemoglobinuria, a rare acquired disorder. It is not associated with increased sensitivity to oxidants & Heinz bodies are absent.

D. Certain viral infections (e.g, Epstein-Barr virus) may induce the transient appearance of anti-red cell antibodies, but such antibodies are not associated with Heinz bodies.

E. Relative deficiency of folate can occur within the setting of increased hematopoiesis & may exacerbate many forms of anemia. It leads to RBC underproduction, not hemolysis.

## Question #12 → Ans

**E. SYSTEMIC LUPUS ERYTHEMATOSUS** → Spherocytes are observed in hereditary spherocytosis, but this patient's disease appears to be acquired, suggesting that the spherocytes are the product of opsonizing anti-RBC autoantibodies. The direct Coombs test is used to detect the presence of antibodies or complement fragments (e.g., C3b) on the surface of patient RBs. This is consistent with the diagnosis of systemic lupus erythematosus, an autoimmune disorder in which autoantibodies are commonly produced against host antigens & cells, including RBCs.

**Incorrect answers:**

A. *E. coli* septicemia might produce disseminated intravascular coagulation leading to microangiopathic anemia associated with schistocytes.
B. Hereditary spherocytosis is caused by inherited defects in the cytoskeleton of RBC membrane. Therefore, direct Coombs test is negative.
C. Infectious mononucleosis may be associated with autoantibodies leading to RBC hemolysis, but such antibodies are usually transient & the hemolysis is usually not severe enough to be clinically significant.
D. Mycoplasma pneumonia infection may be associated with autoantibodies leading to RBC hemolysis, but such antibodies are usually transient & the hemolysis is usually not severe enough to be clinically significant.

## Question #13 → Ans

**A. HEMOLYSIS OF ANTIBODY-COATED CELLS** → Hydrops is consistent with heart failure due to severe anemia & jaundice & the positive direct Coombs test is consistent with antibody-mediated RBC hemolysis. Historically, the most likely cause of hemolytic disease of the newborn was Rh incompatibility, in which a multiparous Rh-negative mother is immunized by previous pregnancies against Rh D antigen. Fortunately, this complication of pregnancy is now rare due to routine administration of an antibody preparation against Rh D to Rh-negative mothers around the time of birth. These antibodies clear Rh-positive fetal red cells & prevent immunization of the mother.

**Incorrect answers:**

B. A hematopoietic stem cell defect could produce severe anemia & hydrops but would not be associated with a positive direct Coombs test.
C. Impaired globin synthesis as in the thalassemias could produce severe anemia & hydrops but would not be associated with a positive direct Coombs test.
D. Mechanical fragmentation of RBCs occurs in microangiopathic hemolytic anemias & is caused by traumatic injury to red cells. It is not consistent with this clinical scenario & would be Coombs test negative.
E. Oxidative injury to hemoglobin is most commonly seen in glucose-6-phosphate dehydrogenase deficiency, which is inconsistent with the clinical scenario & also produces Coombs test-negative anemia.

## Question #15 → Ans

**C. FERRITIN** → The patient has microcytic anemia, which is most commonly caused by iron deficiency. The other causes of microcytic anemia are thalassemia, which would present early in life; rare forms of sideroblastic anemia caused by defects in heme synthesis & the anemia of chronic inflammation, which may be associated with a slightly lower than normal MCV (unlike this case, where the MCV is significantly lower than normal). Ferritin levels in the serum generally reflect total body iron stores & would be expected to be low in this patient with suspected iron deficiency anemia.

**Incorrect answers:**

A. Vitamin $B_{12}$ deficiency is associated with megaloblastic anemia, marked by an elevated MCV.
B. Ascorbic acid (vitamin C) deficiency leads to scurvy, which is not associated with microcytic anemia.
D. C-reactive protein is often increased in inflammatory disorders, which may produce the anemia of chronic disease; however, the significantly low MCV in this case excludes this diagnosis.
E. Transferrin levels will be elevated in iron deficiency, but ferritin levels more directly reflect iron stores. Typically, a serum iron level also would be obtained.

## Question #16 → Ans

**A. INCREASED SYNTHESIS OF HEPCIDIN IN THE LIVER** → The laboratory findings of a slightly microcytic anemia associated with elevated ferritin, low serum iron with low transferrin level (measured as total iron binding capacity) & low erythropoietin are consistent with the anemia of chronic inflammation. In this disorder, elevated levels of inflammatory cytokines such as IL-6 increase the hepatic synthesis of hepcidin, which decreases the mobilization of iron from macrophages by promoting the degradation of ferroportin & suppress erythropoietin production by the kidney.

**Incorrect answers:**

B. Chronic blood loss is one cause of iron deficiency, which would be associated with a lower ferritin level, a lower MCV & an elevated transferrin level.
C. Decreased intake of heme iron is another cause of iron deficiency anemia, which would be associated with a lower ferritin level, a lower MCV & an elevated transferrin level.
D. An increase in the level of ferroportin is also a feature of iron deficiency anemia, in which hepatic hepcidin production is suppressed.
E. IL-6 is produced by immune cells as well as various other cell types & acts on the liver to increase hepcidin synthesis. IL-6 production is generally increased in systemic inflammatory states, not decreased.

## Question #17 → Ans

**A. IMPAIRED DNA SYNTHESIS** → The patient is pancytopenic & has a macrocytic anemia & the peripheral smear shows features of megaloblastic anemia (red cells are larger than normal & oval-shaped; lack central pallor & appear full of hemoglobin; neutrophil is hypersegmented). Megaloblastic anemias are caused by defects in thymidine synthesis (a building block of DNA) that stem from deficiencies of vitamin $B_{12}$ or folate or from exposure to drugs that interfere with folate metabolism (e.g., methotrexate). Alcoholics typically have poor diets & are prone to develop folate deficiency, which is the likely culprit in this patient.

**Incorrect answers:**

B. Extravascular hemolysis of antibody-coated cells would be associated with a normal to slightly elevated MCV & would not produce pancytopenia.

C. Imbalance in synthesis of α-globin & β-globin chains defines thalassemia, which produces a microcytic anemia & doesn't affect platelet or white cell production.

D. Increased susceptibility to lysis by complement is seen in paroxysmal nocturnal hemoglobinuria, a rare cause of intravascular hemolysis that is not in the differential diagnosis of a markedly macrocytic anemia.

E. Reduced deformability of RBC membranes, as may occur in hereditary spherocytosis, may lead to hemolysis, but cannot explain marked macrocytosis or pancytopenia.

## Question #18 → Ans

**E. VITAMIN $B_{12}$ DEFICIENCY** → The patient has history of Crohn disease involving the terminal ileum, which was removed during surgery & now has macrocytic anemia, suggesting that she has developed megaloblastic anemia (high MCV & abnormal neutrophils). Vit $B_{12}$ is taken up in the terminal ileum by receptors that recognize $B_{12}$ bound to intrinsic factor, which is produced in the stomach. Normally, the liver contains enough stored $B_{12}$ to last for 3-5 years, but this patient's stores were likely marginal due to chronic inflammation that disrupted $B_{12}$ uptake in the ileum. With removal of the terminal ileum, the patient rapidly developed frank $B_{12}$ deficiency & megaloblastic anemia.

**Incorrect answers:**

A. Anemia of chronic disease is associated with normal to slightly microcytic anemia.

B. Anemia of chronic blood loss is associated with iron deficiency & microcytic anemia.

C. Hemolytic anemia is not associated with marked macrocytosis & would be accompanied by reticulocytosis, rather than reticulocytopenia.

D. Aplastic anemia is not associated with marked macrocytosis & is likely to cause more severe pancytopenia.

## Question #29 → Ans

**C. *MYCOBACTERIUM TUBERCULOSIS* INFECTION** → The peripheral blood shows leukocytosis with a predominance of lymphocytes & an absolute monocytosis. Among the possible answers, only tuberculosis would produce these changes in the peripheral blood. Upper lobe involvement is common in secondary (reactivated) tuberculosis.

**Incorrect answers:**

A. Acute lymphoblastic leukemia usually involves the bone marrow & suppresses normal hematopoiesis, leading to cytopenias, sometimes associated with peripheral blasts. It would not produce a lung mass.

B. Chronic lymphocytic leukemia is associated with lymphocytosis but is not likely to be complicated by infections that produce mass-like lesions in the lung.

D. Myelodysplastic syndrome involves the bone marrow & causes ineffective hematopoiesis, leading to cytopenias, sometimes associated with peripheral blasts. It would not produce a lung mass.

E. *Staphylococcus aureus* abscess might present as a lung mass (most commonly in the lower lobes) but would cause neutrophilia rather than lymphocytosis.

## Question #31 → Ans

**A. ACTIVATION OF CYTOTOXIC T CELL RESPONSE** → The chief differential diagnosis in this case is bacterial pharyngitis versus a viral infection, particularly infectious mononucleosis. The figure shows atypical lymphocytes with abundant cytoplasm that are sticking to adjacent red cells, so-called kissing cells. These lymphocytes are cytotoxic T cells; the binding to red cells is presumably mediated by adhesion molecules & is characteristic of certain viral infections, particularly those mediated by herpesviruses. The clinical scenario given above is entirely consistent with infectious mononucleosis caused by Epstein-Barr virus (EBV) infection, which would need to be confirmed with a mono-spot test (the laboratory test referred to in the case).

**Incorrect answers:**

B. Activation of the innate immune system (e.g., complement cascade) has little role in effective responses to EBV infection.

C. Activation of the innate immune system (e.g., macrophages) has little role in effective responses to EBV infection.

D. Patients develop antibodies against EBV antigens, but these don’t protect patients from reactivation of infection if T-cell immunity wanes.

E. B cells are the target of EBV infection & are activated to proliferate by the virus. It is the elimination of these cells by cytotoxic T cells that produces the symptoms in those with infectious mononucleosis.

## Question #32 → Ans

**A. THE MAJORITY OF SUCH CASES ARE CURED BY CHEMOTHERAPY** → The clinical presentation (young age, mediastinal mass), expression of T cell markers & a marker of immaturity (TdT) is consistent with T lymphoblastic lymphoma/leukemia (T-ALL), a tumor that is cured in about 80% of cases by intensive chemotherapy.

**Incorrect answers:**

B. Since about 80% of cases are cured by intensive chemotherapy, median survival is much longer than 1 year.

C. Without treatment, T-ALL is fatal in weeks to a few months.

D. T-ALL is not associated with HTLV-1 virus; HTLV-1 is associated with a rare neoplasm of mature CD4-positive T cells called adult T-cell leukemia/lymphoma that usually occurs in older adults.

E. Skin involvement may be seen in T-ALL, but the disease preferentially involves the thymus & the bone marrow & to lesser degrees the lymph nodes & the spleen. Skin involvement is typical of the neoplasm of CD4+ T cells called mycosis fungoides/Sezary syndrome.

## Question #35 → Ans

**B. OVEREXPRESSION OF BCL2 CAUSING RESISTANCE TO APOPTOSIS** → The clinical, morphologic & immunophenotypic features are consistent with follicular lymphoma, in which t(14;18) leads to overexpression of BCL2, an inhibitor of apoptosis (programmed cell death). This causes resistance to chemotherapy, which kills cells by inducing apoptosis.

**Incorrect answers:**

A. Overexpression of MYC is a feature of rapidly growing lymphomas, particularly Burkitt lymphoma, which is CD10+ but consists of sheets of “blastoid” cells that often undergo apoptosis, producing a “starry sky” appearance.

C. Expression of *BCR-ABL* is a feature of chronic myeloid leukemia & some forms of B-ALL, which may be CD10+ but present in marrow & blood. *BCR-ABL* is a constitutively active tyrosine kinase & neoplasms with this fusion can be treated with tyrosine kinase inhibitors.

D. Chronic lymphocytic leukemia/small lymphocytic lymphoma is composed of monomorphous proliferation of small, round CD5+/CD10- B cells & multiple myeloma, a tumor of neoplastic plasma cells, are associated with decreased production of functional antibodies.

E. Overexpression of cyclin D1 causing impaired G1-S transition of cell cycle is a feature of mantle cell lymphoma, a CD5+/CD10 negative B cell tumor.

## Question #36 → Ans

**B. PROLONGED SURVIVAL EVEN WITHOUT TREATMENT** → The peripheral smear shows a lymphocytosis consisting of small, mature-looking lymphocytes which is typical of chronic lymphocytic leukemia (CLL). The lymphocytes are fragile & are frequently disrupted, resulting in “smudge cells”, CLL is increasingly being diagnosed in asymptomatic patients based on peripheral blood findings. Such patients may survive for 10 years or longer without therapy, although disease progression eventually occurs.

**Incorrect answers:**

A. Selective involvement of the skin is a feature of mycosis fungoides & Sezary syndrome, which are tumors of CD4+ T cells with predilection of affecting the skin.

C. Death caused by blast crisis is a feature of transformed chronic myeloid leukemia.

D. Bone marrow involvement is common in CLL.

E. Hyperviscosity syndrome is a feature of lymphoplasmacytic lymphoma, a different indolent B-cell tumor in which the tumor cells secrete IgM in large amounts, producing hyperviscosity of the blood.

## Question #37 → Ans

**B. EPSTEIN-BARR VIRUS** → Patients with HIV infection are at higher risk of B-cell lymphomas, mostly diffuse large B-cell lymphoma & Burkitt lymphoma. Many of these tumors are EBV-positive, particularly in the setting of HIV-related T-cell immunosuppression. Such tumors have a predilection for extra nodal sites, including the gut wall & the central nervous system.

**Incorrect answers:**

A. Cytomegalovirus is not oncogenic.

C. HIV infection increases the risk of lymphoma by suppressing immunity against oncogenic viruses such as EBV but is not itself oncogenic.

D. Human herpesvirus 8 is associated with rare aggressive B-cell lymphomas that present as effusions. It is also associated with Kaposi sarcoma, which is not a lymphoid malignancy.

E. Human T-cell lymphotropic virus type 1 is associated with adult T-cell lymphoma/leukemia, a T cell neoplasm that is not increased in patients with HIV infection.

## Question #38 → Ans

**B. *MYC*** → The t(8;14) fuses the *MYC* oncogene on chromosome & to the immunoglobulin heavy chain locus (IGH) on chromosome 14; this places *MYC* under the control of highly active IGH regulatory elements, leading to its overexpression. This translocation is present in a high fraction of Burkitt lymphoma, a very aggressive B cell tumor that usually presents at extra nodal sites such as the gut. This tumor occurs mainly in children & young adults.

**Incorrect answers:**

A. *BCL6* is involved in diverse chromosomal translocations, mainly in nodal diffuse large B-cell lymphomas.

C. *CCND1* (gene encoding Cyclin D1) is involved in a t(11;14) that is seen mainly in mantle cell lymphoma.

D. *JAK2* mutation is most commonly seen in polycythemia vera & other myeloproliferative neoplasms.

E. *BCR-ABL* fusion genes are seen in chronic myeloid leukemia & a subset of B-cell acute lymphoblastic leukemia

## Question #39 → Ans

**C. DIFFUSE LARGE B-CELL LYMPHOMA** → The clinical, immunophenotypic & genetic features best fit diffuse large B-cell lymphoma, an aggressive tumor of large B cells that is the most common lymphoma in adults & responds well to chemotherapy. Mutations that lead to overexpression of the BCL6 gene are common in this type of lymphoma. It may involve nodal or extra nodal sites & is a form of non-Hodgkin lymphoma; one characteristic that separates non-Hodgkin lymphoma from Hodgkin lymphoma is that Hodgkin lymphoma rarely involves Waldever ring, the lymphoid tissues that are present in the oropharynx.

**Incorrect answers:**

A. Acute lymphoblastic lymphoma is a T-cell lymphoma that typically occurs in children & involves the mediastinum. It is TdT positive & not associated with BCL6 mutations.

B. Burkitt lymphoma is associated with MYC translocations, not mutations in BCL6.

D. Hodgkin lymphoma is a B-cell tumor in which rare tumor giant cells are seen in a predominant background of reactive inflammatory cells. It rarely involves Waldeyer ring.

E. Small lymphocytic lymphoma is a tumor that is identical to chronic lymphocytic leukemia, but with fewer circulating cells. It is an indolent tumor of small B cells that are CD10 negative & CD5 positive. It involves multiple lymph nodes as well as the liver & spleen.

## Question #43 → Ans

**C. INFLAMMATORY CYTOKINES SECRETED BY *H. PYLORI*-SPECIFIC T CELLS** → *H. pylori* infection of the gastric mucosa induces a chronic inflammatory response in which cytokines secreted by T cells stimulate the proliferation of B cells. If sustained, B cells may acquire mutations that lead to neoplastic transformation that takes the form of extra nodal marginal zone B cell lymphoma (as known in this instance as mucosa-associated lymphoid tissue [MALT] lymphoma), but initially the cells still depend on T-cell “help” to proliferate; thus, treatment of *H. pylori* may suppress the T-cell response, leading to regression of the B-cell proliferation.

**Incorrect answers:**

A. *H. pylori* encoded proteins have a variety of pathogenic effects, but do not directly suppress RB; this is a feature of transforming DNA viruses such as high-risk human papilloma viruses (HPVs).

B. Inactivation of p53 function by *H. pylori* encoded proteins does not occur; this also is a feature of transforming DNA viruses such as high-risk human papilloma viruses (HPVs).

D. *H. pylori* is not known to increase mutational rates in helper T cells.

E. Accelerated telomere shortening has not been related to *H. pylori* infection.

## Question #40 → Ans

**C. PLASMA CELLS** → Infection, renal failure & lytic bone lesions all suggest the diagnosis of multiple myeloma, a malignant tumor of plasma cells.

**Incorrect answers:**

A. Myeloblasts are seen in acute myeloid leukemia, which is associated with infection but not renal failure or lytic bone lesions.
B. Small mature lymphocytes is a feature of chronic lymphocytic leukemia (CLL), which is associated with infection but not renal failure or lytic bone lesions.
D. Reed-Sternberg cells are associatedok with Hodgkin lymphoma, which isn't commonly associated with any of the clinical features in this case.
E. Lymphoblasts are a feature of acute lymphoblastic leukemia (ALL), which is associated with infection but not renal failure or lytic bone lesions.

## Question #42 → Ans

**A. BENCE JONES PROTEINS IN THE URINE** → The bone marrow is replaced by abnormal plasma cells, including multinucleate cells with prominent nucleoli. Malignant plasma cells cause the secretion of RANKL by marrow stromal cells, which in turn activates osteoclasts, giving rise to lytic bone lesions. The bone pain & pathologic findings are consistent with multiple myeloma, a tumor of plasma cells that often produces free immunoglobulin light chains that enter the urine as Bence Jones proteins.

**Incorrect answers:**

B. Serum alkaline phosphatase level is elevated (not reduced) when bone destruction & remodeling occur.
C. Hypogammaglobulinemia is a feature of certain B cell neoplasms such as chronic lymphocytic leukemia. Myeloma is usually associated with hypergammaglobulinemia due to production of a single monoclonal immunoglobulin; patients are often functionally hypogammaglobulinemic because normal antibody production is suppressed.
D. Platelet count of 750,000/mm$^3$ is a feature of some reactive conditions & myeloproliferative neoplasms, such as essential thrombocythemia, which are most commonly associated with bleeding/thrombosis & not the features seen in this case.
E. WBC count of 394,000/mm$^3$ (4,500-11,000/mm$^3$) would most commonly be seen in acute leukemia & myeloproliferative neoplasms, which are not consistent with the other data provided.

## Question #44 → Ans

**B. LYMPHOCYTES WITH FINE PROJECTIONS FROM THE CYTOPLASM** → The clinical, laboratory & genetic findings are consistent with hairy cell leukemia, an indolent neoplasm of mature B cells that usually presents with marrow, spleen & peripheral blood involvement. Lymphocytes with fine, hair-like projections from the cytoplasm are characteristically seen in the blood. It often presents with cytopenias & splenomegaly & is highly associated with somatic mutations that cause activation of the BRAF kinase, a component of the RAS signaling pathway. For unclear reasons, this tumor is associated with increased susceptibility to infection by atypical mycobacteria.

**Incorrect answers:**

A. Auer rods in myeloid cells are a feature of acute myeloid leukemia, which pursues an acute course & is not associated with splenomegaly.
C. Monoclonal IgM in serum is a feature of lymphoplasmacytic lymphoma, which mainly produces symptoms due to hyperviscosity.
D. t(9:22) translocation in stem cells is a feature of chronic myeloid leukemia, which is associated with leukocytosis & is not associated with an increased risk of infection.
E. Cytoplasmic toxic granulations in neutrophils are associated with infection, but not splenomegaly or BRAF mutation.

## Question #46 → Ans

**A. B LYMPHOCYTE, EPSTEIN-BARR VIRUS (EBV)** → The clinical, morphologic & immunophenotypic findings are consistent with classic Hodgkin lymphoma, a tumor in which neoplastic CD15+, Reed-Sternberg cells of B cell origin, are infected with EBV in a subset of cases. In addition to Reed-Sternberg cells, there is a mixed (non-neoplastic) inflammatory cell infiltrate that far outnumbers Reed-Sternberg cells.

**Incorrect answers:**

B. Human T-lymphotropic virus-1 (HTLV-1) infection of CD4+ lymphocytes is associated with adult T-cell leukemia/lymphoma, which occurs in older adults & has different morphologic features.
C. Human herpesvirus-8 infection of endothelial cells is associated with Kaposi sarcoma, a proliferation of virally infected spindle-shaped cells. Human herpesvirus-8 infection of endothelial cells is associated with Kaposi sarcoma, a proliferation of virally infected spindle-shaped cells & primary effusion lymphoma, which may arise within the pleural cavity, pericardium, or peritoneum.
D. Human immunodeficiency virus infection of macrophages modifies their function, but is not transforming.
E. NK cells are not infectable by cytomegalovirus & cytomegalovirus is not transforming.

## Question #30 → Ans

**D. LEUKEMOID REACTION** → There is marked leukocytosis with a left shift, raising the possibility of a myeloid leukemia, particularly chronic myeloid leukemia (CML). However, CML is associated with the t(9;22) as well as eosinophilia, basophilia & thrombocytosis in the peripheral blood. The absence of these findings strongly suggests that the changes in the blood are a reaction to a severe infection giving rise to a leukemia like picture.

**Incorrect answers:**

A. Chronic myeloid leukemia can be excluded based on the absence of the (9;22) and the lack of eosinophilia, basophilia & thrombocytosis in the peripheral blood.

B. Polycythemia vera is associated with an elevated red cell mass, leading to an increase in the hematocrit & hemoglobin, which are absent.

C. Hodgkin lymphoma, lymphocyte depletion type, usually presents with lymphadenopathy, does not involve the lungs until late in the disease & does not cause a leukemoid reaction.

E. Myelodysplastic syndrome is characterized by ineffective hematopoiesis, is associated with low blood counts & is uncommon in young adults.

## Question #48 → Ans

**E. t(14;18)** → The leukemic cells are large in size & have prominent nuclei and nucleoli. The cytoplasm contains many granules (a feature of promyelocytes), some of which take the shape of slender rods (Auer rods). These features are characteristic of acute promyelocytic leukemia, which is associated with the t(15;17). Procoagulant granules released from the promyelocytes cause disseminated intravascular coagulation. The microthrombi formed in small blood vessels cause mechanical injury to the red cells, creating schistocytes.

**Incorrect answers:**

A. t(8;14) is associated with Burkitt lymphoma, which only rarely causes disseminated intravascular coagulation & is not associated with promyelocytes with Auer rods in the peripheral blood.

B. t(8;21) is associated with a genetic subtype of acute myeloid leukemia; this subtype often is associated with the presence of Auer rods in myeloblasts, but not the characteristic promyelocytes. It is uncommonly associated with disseminated intravascular coagulation.

C. t(9;22) is associated with chronic myeloid leukemia, in which myeloid maturation is relatively normal & Auer rods are not seen.

D. t(14;18) is associated with follicular lymphoma and diffuse large B-cell lymphoma, which only uncommonly involve the peripheral blood & have different (lymphoid) morphologies.

## Question #49 → Ans

**B. ACUTE MYELOID LEUKEMIA** → The micrograph shows blasts & peroxidase is a marker of myeloblasts. The history of anemia & thrombocytopenia with gingival hemorrhages along with complete replacement of bone marrow cells by myeloblasts is characteristic of acute myeloid leukemia.

**Incorrect Answers:**

A. Acute lymphoblastic leukemia also would show blasts, but they would be agranular & peroxidase negative.

C. Chronic lymphocytic leukemia would show an increased number of mature-appearing, peroxidase-negative lymphocytes.

D. Chronic myeloid leukemia would show increased numbers of mature granulocytes & few if any blasts.

E. Hodgkin lymphoma almost never involves the peripheral blood.

## Question #52 → Ans

**A. EXTRAMEDULLARY HEMATOPOIESIS** → Primary myelofibrosis is a myeloproliferative neoplasm in which the marrow becomes fibrotic due to secretion of fibrogenic cytokines such as transforming growth factor (TGF)-beta by neoplastic megakaryocytes. Initially, the marrow is hypercellular, with tri-lineage proliferation. As this disease advances & the marrow becomes fibrotic & hematopoiesis shifts to the spleen, which may enlarge dramatically. Typically, there are immature myeloid as well as erythroid cells in the peripheral blood, both because they are released abnormally from the distorted marrow due to the fibrosis & also because they tend to escape from sites of extramedullary hematopoiesis, particularly the spleen.

**Incorrect answers:**

B. Granulomas with Histoplasma capsulatum can cause splenomegaly, but usually not marked splenomegaly. It is not associated with clusters of abnormal megakaryocytes.

C. Hodgkin lymphoma usually presents with splenomegaly only late in the course of the disease. It is not associated with clusters of abnormal megakaryocytes.

D. Metastatic adenocarcinoma is an unlikely cause of splenomegaly. It is not associated with clusters of abnormal megakaryocytes.

E. Portal hypertension can cause splenomegaly, but we have no evidence of liver disease & extramedullary hematopoiesis is a much more likely explanation for the splenomegaly. It is not associated with marrow fibrosis or clusters of abnormal megakaryocytes.

## Question #20 → Ans

**A. CONSUMPTION OF COAGULATION FACTORS** → The clinical & laboratory findings are consistent with disseminated intravascular coagulation (DIC), which is caused by release of prothrombotic substances into the blood & systemic activation of the coagulation cascade. Among the most frequent causes are disorders of pregnancy, including retention of a dead fetus, which may shed prothrombotic substances that reach the maternal circulation.

**Incorrect answers:**

B. In DIC, platelets function normally but are "used up," leading to a quantitative defect in platelet function.
C. Increased vascular fragility does not contribute to the bleeding that accompanies DIC, but is seen in scurvy.
D. Marrow function is usually normal in DIC unless it is caused by a bone marrow disorder (e.g., acute promyelocytic leukemia).
E. In this setting, DIC stems from procoagulants released from the retained dead fetus, not from endothelial injury.

## Question #23 → Ans

**E. THROMBOTIC THROMBOCYTOPENIC PURPURA** → The presence of schistocytes coupled with thrombocytopenia is consistent with a microangiopathic hemolytic anemia, the chief differential of which is disseminated intravascular coagulation (DIC), hemolytic uremic syndrome (HUS) & thrombotic thrombocytopenia purpura (TTP). TTP often is associated with CNS abnormalities and renal failure & the normal PT & PTT exclude DIC. Thus, the best answer is TTP.

**Incorrect answers:**

A. Autoimmune hemolytic anemia is associated with spherocytes & does not produce thrombocytopenia.
B. Disseminated intravascular coagulation is associated with an elevated PT & PTT because of consumption of coagulation factors.
C. Idiopathic thrombocytopenic purpura is associated with isolated thrombocytopenia; schistocytes are not seen.
D. Paroxysmal nocturnal hemoglobinuria is associated with an increased risk of thrombosis and does not usually produce thrombocytopenia; schistocytes are absent.

## Question #25 → Ans

**B. DESTRUCTION OF IgG-COATED PLATELETS BY THE SPLEEN** → The patient has a bleeding disorder consistent with isolated platelet dysfunction associated with what appears to be an acquired quantitative platelet defect. The most common cause of such clinical & laboratory findings is immune thrombocytopenia purpura (ITP), in which antibodies against platelet glycoproteins act as opsonins, leading to increased destruction by macrophages in the spleen & elsewhere.

**Incorrect answers:**

A. DIC would also cause thrombocytopenia & increased risk of bleeding, but the PT & PTT would be prolonged and it is likely that the patient would be sick because DIC is often associated with severe illnesses such as sepsis.
C. ADAMTS13 is a protease that normally degrades large multimers of vWF. In the absence of ADAMTS13, large multimers of VWF cause excessive platelet activation & aggregation, leading to microvascular thrombosis. Deficiency of ADAMTS13 may be inherited or acquired. In the acquired form, there are autoantibodies against ADAMTS13. Deficiency of ADAMTS13 causes thrombotic thrombocytopenic purpura (TTP), in which microvascular thrombosis is associated with other clinical features, such as CNS dysfunction & renal failure. TTP is a severe & often fatal illness without prompt treatment.
D. An isolated defect in platelet production could also produce the same phenotype, but only very rarely is the cause of thrombocytopenia; in addition, megakaryocytes in the bone marrow would most likely be decreased, rather than increased.
E. Defects in platelet aggregation, in general, are not associated with thrombocytopenia.

A 9-year-old girl is brought to the physician by her mother because of a 4-day history of fever, runny nose and pain in her right ear. She had a mild runny nose a week prior to the current presentation. The mother reports that the daughter has had similar episodes 3 times in the past 2 years. Physical examination shows a bulging tympanic membrane and tender superficial cervical lymphadenopathy. Which of the following features most likely contributed to the development of her secondary bacterial infection?
A: Pre-disposing immunocompromised status
B: Exposure to an unvaccinated, infected playmate
C: Fungal infection suppresses induction of Interferon-gamma
D: Migration of nasopharyngeal flora to inner ear canal via Eustachian tubes.
E: Seasonal allergies

A 45-year-old man comes to the physician because of a 3-week history of fever, headache, and dry cough. He is from the midwestern USA, specifically Michigan (Great Lakes area) and he is an archaeologist. He has no sick contacts and cannot recall any specific exposures. His symptoms developed 2 weeks after he had worked on a local excavation project in the Ohio River valley (Northwest). Physical examination shows low grade fever and scattered rales in all lung fields. There is no organomegaly or skin lesions. Laboratory studies shows an induration of 3 mm on a PPD test. Which of the following is the most likely causal agent?
A: Histoplasma capsulatum
B: Mycobacterium tuberculosis
C: Pneumocystis jirovecii
D: Coccidioides immitis
E: Aspergillus fumigatus
F: Cryptococcus neoformans
G: Paracoccidioides brasiliensis

A 9-year-old girl is brought to the physician by her mother because of a 2-day history of runny nose, congestion and sore throat. The physician has seen several patients with similar complaints in the past two weeks, since the start of June. No one reported gastrointestinal symptoms. Physical examination shows clear discharge and mild erythema of the nasal mucosa. The symptoms spontaneously resolved 5 days later with supportive treatment. Which of the following is the most likely diagnosis?
A: Rhinopharyngitis
B: Pharyngoconjunctivitis
C: Otitis media
D: Interstitial pneumoniae
E: Strep throat

A 72-year-old woman comes to the physician because of a 3-month history of progressive shortness of breath, night sweats, persistent fatigue and weight loss of 12.7 kg (28 lbs). She has lived in the USA for the past 15 years after immigrating from Pakistan. Physical examination shows generalized lymphadenopathy and crackles in the lungs fileds. Laboratory studies show abundant acid-fast bacilli in the sputum. Serum cold agglutination test is negative and QuantiFERON test is positive. Which of the following is the most likely causal agent?
A: Non-typeable Haemophilus influenzae
B: Streptococcus pneumoniae
C: Coccidioides immitis
D: Mycoplasma pneumoniae
E: Mycobacterium tuberculosis

A 77-year-old woman comes to the physician because of a 3-week history of low fever and a cough productive of scant sputum. Her temperature is 37.3oC (99.1o F) and her blood pressure is 125/80 mmHg. Physical examination shows faint rhonchi in left lower lung field. X-rays of the chest show a focal dense opacity in the lower left lobe. Laboratory studies from a broncho-alveolar lavage sample shows filamentous bacteria (see image) that is visualized with modified Ziehl-Neelson staining procedure. Which of the following is the most likely causal agent?
A: Mycobacterium tuberculosis
B: Streptococcus pneumoniae
C: Nocardia asteroides
D: Pseudomonas aeruginosa
E: Mycoplasma pneumonia

A 20-year-old woman comes to the physician because of a 4-week history of exertional shortness of breath, nonproductive cough and fatigue. She lives in a campus dormitory and is up to date with recommended vaccinations. Her temperature is 38° C (100.4 ° F), pulse is 90/min and blood pressure is 112/72 mmHg. Physical examination shows scattered rhonchi and crackles in all lung fields. Laboratory studies of sputum sample are negative for imaging with Gram and Acid-Fast staining. The serum cold agglutination test yields a positive result. Which of the following characteristics best accounts for the organism�s resistance to penicillin class of antibiotics?

A: Facultative intracellular growth
B: Altered Penicillin-Binding Protein PBP
C: Thick mycolic acid layer
D: Porins in outer cell wall
E: No cell wall

A 3-year-old child is brought to the physician by her parents because of a 1-month history of refusal to eat, night sweats and persistent worsening cough. The family recently returned from a year-long mission trip to Malaysia. Her temperature is 38.1°C (100.6°F). Physical examination shows crackles and diffuse rhonchi. An X-ray of the chest shows characteristic Ghon focus opacities. Laboratory studies show positive PPD test and sputum culture for strict aerobic bacteria. Which of the following virulence factors does the causal agent most likely produce, that protects the bacteria from desiccation and intracellular killing by macrophages?
A: Polysaccharide capsule
B: Lipid A
C: Mycolic acid
D: P1 Adhesin
E: Type 3 Secretion System

A 29-year-old man comes to the physician because of a 3-day history of fever, pleuritic chest pain, difficulty breathing and productive cough with thick yellow-green sputum. He has been diagnosed with Cystic Fibrosis and has been hospitalized 3 times in the last 18 months. His temperature is 40°C (104°F), pulse is 125/min, respirations are 30/min and blood pressure is 120/78mmHg. Physical examination shows bronchial breath sounds and increased vocal resonance in the left upper lobe. Laboratory studies of sputum samples show numerous Gram-negative bacilli that are oxidase (+). Which of the following best characterizes the causal agent?
A: Production of pyocyanin
B: Lipoteichoic acid in cell wall
C: Secretion of a superantigen
D: Presence of a thick lipid cell wall
E: Production of endospores

A 54-year-old woman comes to the physician because of a 5-day history of chest pain and dry cough. She also has a moderate headache, fatigue, muscle aches and diarrhea. She was recently diagnosed with diabetes. Physical examination shows wheezes and crackles present in all lung fields. Laboratory studies show positive rapid antigen test to Enveloped ss (+)RNA virus. Which of the following host cell factors most likely determines tissue tropism for the causal agent?
A: Ciliated epithelial cells
B: Sialic acid
C: ICAM-1
D: ACE2
E: CCR5

A 7-month-old girl is brought to the emergency department by her parents because of a 2-day history of fever and gasping for breath. Her temperature is 38°C (100.4°F), and pulse is 190/min. She has received the recommended pediatric vaccines at 2- and 4-month check-ups. Physical examination shows intercostal retractions, occasional faint, fine crackles and prominent bilateral diffuse wheezes in all lung fields. An X-ray of the chest shows interstitial infiltrates with focal inflammation in bronchioles. Laboratory studies show a virus that forms syncytia. Which of the following is most likely a feature that mediates cell-to-cell spread of the causal agent?
A: F protein
B: L protein
C: HN protein
D: VP protein
E: Spike protein

An 8-year-old boy is brought to the physician by his mother because of a 2-day history of high fever and a sore throat. Physical examination shows significant erythema of pharynx and tonsils, with notable purulent exudate. Laboratory studies from pharyngeal swab show Gram positive cocci that are catalase negative and positive for Lancefield Group A. Which of the following is a most likely sequelae for untreated infection with this microorganism?
A: Meningitis
B: Atypical pneumonia
C: Oral thrush
D: Coagulopathy
E: Damage to heart valves

A 48-year-old man comes to the emergency department because of a 3-day history of worsening cough and body aches. He has 600 pack years smoking history and was diagnosed with Chronic Obstructive Pulmonary Disease 5

years prior. Physical examination shows increased vocal resonance and red-tinged purulent sputum. Which of the following vaccinations is most likely recommended for this patient to prevent high-risk acute exacerbation episodes of broncho-pneumonia?
A: Adenovirus
B: Pneumococcal
C: Hib
D: DTaP
E: Rhinovirus

A 64-year-old man comes to the physician because of 3-month history of cough and 5-kg (11 lb.) weight loss. Physical examination shows clubbing of the fingers. He is afebrile. An x-ray of the chest shows no hilar adenopathy, but there is cavitation within a 3-cm lesion near the right hilum. Laboratory studies show elevated serum calcium levels. Bronchoscopy shows a lesion almost occluding the right main bronchus. A surgical procedure with curative intent is attempted. Which of the following neoplasms is most likely in this patient?
A: Adenocarcinoma in situ
B: Large cell anaplastic carcinoma
C: Metastatic renal cell carcinoma
D: Small cell anaplastic carcinoma
E: Squamous cell carcinoma

A 29-year-old man comes to the physician because of acute onset of hemoptysis. He does not have any other major illnesses. His temperature is 37°C, pulse is 83/min, respirations are 28/min, and blood pressure is 150/95 mm Hg. An x-ray of his chest shows bilateral fluffy infiltrates. A transbronchial lung biopsy on microscopic examination shows focal necrosis of alveolar walls associated with prominent intra-alveolar hemorrhage. Two days later, he has oliguria. His blood urea nitrogen (BUN) and serum creatinine are elevated. Which of the following antibodies is most likely involved in the pathogenesis of his condition?
A: Anti-DNA topoisomerase I antibody
B: Anti-glomerular basement membrane antibody
C: Antimitochondrial antibody
D: Anti-neutrophil cytoplasmic antibody
E: Antinuclear antibody

A 25-year-old man comes to the physician because of acute onset of fever, cough, dyspnea, headache, and malaise. The symptoms first occured a day after moving into a new apartment and then resolved when he visited a friend in another city. Physical examination is unremarkable. A chest radiograph also is unremarkable. Which of the following pathogenic mechanisms is most likely to produce this patient's symptoms?
A: Antigen-antibody complex-mediated injury
B: Antibody-mediated injury to basement membrane
C: Generation of prostaglandins by basophil recruitment
D: Release of histamine from mast cells
E: Toxic injury to type I pneumocytes caused by inhaled dust

A 64-year-old man comes to the physician because of 2-year history of worsening dyspnea on exertion. His vital signs are all within normal limits. Physical examination shows clubbing of the fingers bilaterally and auscultation of his chest shows fine bibasilar inspiratory crackles. Spirometry studies show reductions in total lung capacity, residual volume, and pulmonary compliance. High-resolution CT imaging of the lungs shows reticular opacities with honeycombing in a predominant subpleural distribution. Which of the following is most likely responsible for his clinical condition?
A: a1-antitrypsin deficiency
B: Cigarette smoking
C: Congestive heart failure
D: Cystic fibrosis
E: Idiopathic pulmonary fibrosis

A 57-year-old woman comes to the physician because of 2-week history of a mild flu-like illness with fever, cough, malaise, and progressive dyspnea. Auscultation of her chest shows focal sparse crackles. Spirometry shows a mild restrictive ventilatory defect. High resolution CT imaging of the lungs shows multiple bilateral and peripheral alveolar ground glass opacities from 1 to 3 cm in size. A lung biopsy shows polypoid plugs of loose organizing connective tissue within alveolar ducts, alveoli, and often bronchioles. The connective tissue is all of the same age. The alveolar walls are relatively normal. Which of the following is the most likely diagnosis?
A: Cryptogenic organizing pneumonia
B: Hypersensitivity pneumonitis
C: Idiopathic pulmonary hypertension
D: Pneumoconiosis from asbestosis
E: Sarcoidosis

A 12-year-old girl is brought to the physician by her mother because of a 2-year history of coughing and wheezing and repeated attacks of difficulty breathing. The attacks are particularly common in the spring. Physical examination shows hyperresonance of the lungs on percussion. A x-ray of the chest shows increased lucency of all lung fields. Laboratory tests show an elevated serum IgE level and peripheral blood eosinophilia. A sputum sample examined microscopically shows increased numbers of eosinophils. Which of the following histologic features is most likely to characterize the lung in her condition?
A: Dilation of respiratory bronchioles with loss of elastic fibers
B: Inflammatory destruction of bronchial walls
C: Interstitial and alveolar edema with hyaline membrane formation
D: Patchy areas of consolidation with leukocytic exudates in alveoli
E: Remodeling of airways with smooth muscle hyperplasia

A 19-year-old woman is brought to the emergency department after receiving blunt abdominal trauma in a motor vehicle accident. On admission to the hospital, her initial hematocrit is 33%, but over the next hour, it decreases to 28%. A paracentesis shows serosanguineous fluid. She is taken to surgery, where a liver laceration is repaired, and 1 L of bloody fluid is removed from the peritoneal cavity. She then remains stable. A CBC performed 3 days later is most likely to show which of the following morphologic findings in her peripheral blood?
A: Basophilic stippling of red cells
B: Hypochromic red cells
C: Leukoerythroblastosis
D: Reticulocytosis
E: Schistocytosis

A 3-year-old boy is brought to the physician by his mother because of 3-month history of poor appetite. The family is from southern Italy. Physical examination shows an underweight child for his height and age, and hepatosplenomegaly. The hemoglobin concentration is 6 g/dL, and the peripheral blood smear shows severely hypochromic and microcytic RBCs. The total serum iron level is normal, and the reticulocyte count is 10%. A radiograph of the skull shows maxillofacial deformities and expanded marrow spaces. Which of the following is the most likely cause of this child's illness?
A: Imbalance in a-globin and b-globin chain production
B: Increased fragility of erythrocyte membranes
C: Reduced synthesis of hemoglobin F
D: Relative deficiency of vitamin B 12
E: Sequestration of iron in reticuloendothelial cells

A 6-year-old boy is brought to the physician by his mother because of a 7-day history of worsening pain in the right side of his groin. Physical examination shows tender, swollen lymph nodes in the right inguinal region. Inguinal lymph node biopsy shows large, variably sized, germinal centers containing numerous mitotic figures. There are numerous parafollicular and sinusoidal neutrophils. Which of the following is the most likely cause of this patient's histologic changes?
A: Acute lymphadenitis
B: Acute lymphoblastic leukemia
C: Follicular lymphoma
D: Sarcoidosis
E: Toxoplasmosis

A 54-year-old previously healthy man comes to the physician because of a 9-month history of minor fatigue on exertion. Physical examination is unremarkable. Laboratory studies show : Parameter Value Normal reference Blood hemoglobin 11.7 g/dL 12-14 g/dL Hematocrit 34.8% 41-50% Mean cell volume (MCV) 73 fL 80-100 fL Platelet count 315,000/mm3 155,000-450,000/mm3 Leukocyte count 8035/mm3 4500-11000/mm3 Which of the following is the most sensitive and cost-effective test that the physician should order to diagnose this patient?
A: Bone marrow biopsy
B: Hemoglobin electrophoresis
C: Serum ferritin
D: Serum haptoglobin
E: Serum iron

A 4-year-old boy is brought to the emergency department by his mother because of a 7-day history of listlessness and a 2-day history of large dark patches on his right thigh and left shoulder. Laboratory studies show: Parameter Value Normal Reference Blood hemoglobin 9.3 g/dL 12-14 g/dL Hematocrit 28.7% 41-50% Mean cell volume (MCV) 96 fL 80-100 fL Platelet count 45,000/mm3 150000-450000/mm3 Leukocyte count 30,990/mm3 4500-11000/mm3 Examination of the peripheral blood smear shows blasts that lack peroxidase-positive granules but contain PASpositive aggregates. Flow cytometry shows the phenotype of blasts to be CD19+ and CD3-. Which of the following is the most likely diagnosis?
A: T-acute lymphoblastic leukemia
B: B-acute lymphoblastic leukemia

C: Acute myelogenous leukemia
D: Chronic lymphocytic leukemia
E: Chronic myelogenous leukemia

A 23-year-old woman, gravida 1, para 0 at 25 weeks' gestation comes to the emergency department because of sudden onset of dyspnea and blue lips. She came to the emergency department 3 weeks ago, because of a 3-day history of absent fetal movements. Her temperature is 37°C, pulse is 106/min, respirations are 23/min, and blood pressure is 80/40 mm Hg. Physical examination shows large ecchymoses over the skin of her entire body. A stool sample is positive for occult blood. Laboratory studies show an elevated prothrombin time and partial thromboplastin time. The platelet count is decreased, plasma fibrinogen is markedly decreased, and fibrin split products are detected. A blood culture is negative. Which of the following is the most likely cause of her bleeding diathesis?
A: Consumption of coagulation factors
B: Defects in platelet aggregation
C: Increased vascular fragility
D: Reduced production of platelets
E: Autoimmune damage to platelets

A 22-year-old woman comes to the physician because of a 2-month history of tiring easily. Physical examination is negative for hepatosplenomegaly or lymphadenopathy. Mucosal gingival hemorrhages are noted. Laboratory studies show: Parameter Value Normal reference Blood hemoglobin 9.5 g/dL 12-14 g/dL Hematocrit 28.2% 41-50% Mean cell volume (MCV) 94 fL 80-100 fL Platelet count 20,000/mm3 150000-450000/mm3 Leukocyte count 107,000/mm3 4500-11000/mm3 Her peripheral blood smear shows blasts with delicate nuclear chromatin, 1-3 prominent nucleoli, fine cytoplasmic azurophilic granules, and Auer rods. A bone marrow biopsy specimen shows 100% cellularity with 25% blasts which are myeloperoxidase positive and few residual normal hematopoietic cells. Which of the following is the most likely diagnosis?
A: Acute lymphoblastic leukemia
B: Acute myelogenous leukemia
C: Chronic lymphocytic leukemia
D: Chronic myelogenous leukemia
E: Hodgkin lymphoma

A 9-year-old boy is admitted to the hospital because of a 1-week history of fever, sore throat, nosebleeds, and bone and joint pain. Physical examination shows a petechial rash over the trunk anteriorly and posteriorly. Laboratory studies confirm the diagnosis of acute lymphoblastic leukemia. He is started on a combination chemotherapeutic regimen. Rasburicase is also administered. Which of the following is most likely the purpose of administration of this drug?
A: Prevent hemorrhagic cystitis
B: Prevent hyperuricemia
C: Reduce cardiotoxicity
D: Prevent myelosuppression
E: Prevent pulmonary toxicity

A 78-year-old man comes to the emergency department because of a swollen left testicle. Physical examination shows a fixed abdominal mass. A CT scan of the pelvis, abdomen and lung shows a large retroperitoneal tumor. A diagnosis of pure seminoma is established from the histological study of the left orchidectomy. The patient receives 4 cycles of cisplatin and etoposide. He is also administered a drug that is an antagonist at 5-HT3 receptors. The purpose of administering this drug to this patient is most likely to assist with which of the following?
A: To reduce nausea and vomiting
B: To reduce peripheral neuropathy
C: To prevent hemorrhagic cystitis
D: To prevent myelosuppression
E: To potentiate the effects of etoposide

A 7-year-old boy is brought to the emergency department because of a 1-week history of intermittent fever, sore throat, tiredness, easy bruising, headache, and bone pain. His father was successfully treated for non-Hodgkins lymphoma 10 years ago. Physical examination shows an ill-appearing boy. A petechial-appearing rash is present over the lower left flank. There is hepatomegaly but no splenomegaly. Laboratory studies confirm the diagnosis of acute lymphoblastic leukemia. He is started on a combination chemotherapeutic regimen which includes vincristine. Which of the following adverse effects is most likely expected with the administration of this drug?
A: Epileptic seizures
B: Acute glomerulonephritis
C: Acute hepatitis
D: Heart failure
E: Peripheral neuropathy

A 5-year-old African American girl is brought to the emergency department by her mother because of a 2-hour history of severe abdominal pain. She was diagnosed with sickle cell disease as an infant and has been hospitalized 4 times in the last 6 months. Physical examination shows a pale child with a left upper quadrant palpable mass. Laboratory studies show hemoglobin of 6.8 g/dL (N:11-13 g/dL), serum unconjugated bilirubin 3.8 mg/dL (N 0.2-0.8 mg/dL), and reticulocyte count 4.6 % (N 1-2%). She is given supportive care and the appropriate therapy for prophylaxis against painful crisis. Which of the following is most likely a sign of toxicity with the prescribed drug?
A: Athralgia
B: Leukopenia
C: Painful mouth ulcers
D: Visual disturbances
E: Microcytic blood changes

A 65-year-old man comes to the physician because of a 3-month history of progressively worsening fatigue and palpitations. He plays golf twice a week and has been using ibuprofen daily for chronic ankle and hip pain for the last 3-years. He admits that his stools occasionally appear dark and sticky. Endoscopy shows a gastric ulcer. Laboratory results show RBCs: 3.1 x 106 mm3 (N: 4.2-5.4 x 1012 mm3), hemoglobin: 8.5g/dL (N: 12-15.5 g/dL), MCV: 70fL (N: 80-100fL), and serum ferritin: 6ng/mL (N: 30-300). He is prescribed the appropriate oral therapy for 6 months for his condition. Which of the following should most likely be co-administered to provide optimal conditions for gastrointestinal absorption?
A: Folic acid
B: Cyanocobalamin
C: Ascorbic acid
D: Hydroxycobalamin
E: Deferoxamine

A 32-year-old woman comes to the emergency department because of a 2-month history of shortness of breath, nonproductive cough, and night sweats. She has no other medical problems. She has a 5 pack-year smoking history. Her temperature is 37.8°C (100°F), blood pressure is 100/70 mmHg, pulse is 88/min and respirations are 20/min. Her SpO2 is 97%. Chest examination shows crackles in the bilateral upper lung fields, normal heart sounds and no respiratory distress. An x-ray of the chest shows consolidation in both upper lung lobes and hilar lymphadenopathy. She is started on a quadruple first-line treatment regimen for 2 months. Which of the following baseline laboratory examinations should most likely be done in this patient?
A: Tuberculin skin test
B: Renal function tests
C: Pulmonary function tests
D: Ishihara test
E: Thyroid function tests

A 59-year-old woman comes to the physician because of a 3-month history of a nonpruritic, and nonpainful skin lesions on the left arm and torso. She also has tingling and numbness of the fingers in her left arm. She has no other medical conditions and does not take any medications. Her temperature is 36.5°C (97.7°F), blood pressure is 110/85 mm Hg, respirations are 16/min and pulse is 74/min. Skin examination shows three 4-cm well circumscribed, hypopigmented patch on the left upper arm, and five 3-cm sharply defined red patches with raised borders with no sensation to pinprick around the torso. The ulnar nerve is thickened and tender at the left elbow. Light touch and pain sensation are absent in the left ulnar distribution. She is started on appropriate treatment. Which of the following drugs were most likely prescribed?
A: Dapsone and rifampin
B: Doxycyxline and rifabutin
C: Dapsone, rifampin, and clozapine
D: Doxycycline, rifampin, and clofazimine
E: Dapsone, rifampin, and clofazimine

A 39-year-old woman comes to the emergency department because of a 4-week history of progressively worsening shortness of breath and nonproductive cough. She has a 2-month history of night sweats, intermittent low-grade fever and 8-kg (17.6 lb.) unintentional weight loss. She has a 10-year history of intravenous drug use and was released from prison 2 months ago. Her temperature is 37.9.0°C (100.2°F), blood pressure is 100/70 mm Hg, pulse is 88/min and respirations are 20/min. Her SpO2 is 95%. Physical examination shows cachexia, crackles in the bilateral upper lung fields, normal heart sounds and no respiratory distress. An x-ray of the chest shows consolidation in both upper lung lobes and hilar lymphadenopathy. She is started on a quadruple first-line treatment regimen for 2 months. The mechanism of resistance to one of these drugs is deletion of KatG. Which of the following drugs is most likely susceptible to this deletion?
A: Ethambutol
B: Rifampin
C: Isoniazid

D: Pyrazinamide
E: Streptomycin

A 39-year-old man with a long history of severe persistent asthma, comes to the emergency department because of severe dyspnea and wheezing. He has been taking 3 inhalations of beclomethasone twice daily and 2 inhalations of albuterol 2 times a day as needed for the past 4-months. He has been smoking 1 pack/day for the last 20 years. His pulse is 130/min, respirations are 30/min and blood pressure is 130/90 mm Hg. He is nebulized with a beta-2 agonist but his symptoms are only partially relieved. Which of the following drugs should most likely be given to this patient to better relieve his bronchoconstriction?
A: Leukotriene receptor antagonist
B: Short-acting muscarinic antagonist
C: Long-acting muscarinic antagonist
D: Inhaled glucocorticoids
E: Phosphodiesterase inhibitor

A 30-year-old man is brought to the emergency department because of a 1-hour history of shortness of breath. He has no other history, takes no medications, and has no allergies. His blood pressure is 135/88 mm Hg, pulse is 102/min, respirations are 36/min, and room air oxygen saturation is 93%. Pulmonary examination shows diffuse expiratory wheezes and a markedly prolonged expiratory phase. He is administered supplemental oxygen by face mask. Which of the following drugs should most likely be administered to this patient?
A: Albuterol
B: Cromolyn
C: Theophylline
D: Tiotropium
E: Montelukast

# RHS Quiz Answers

1. **Correct Answer: D**
   **Rationale:** Children are frequent carriers of normally benign endogenous bacteria, including Strep pneumoniae, Non-typeable Haemophilus influenzae and Moraxella catarrhalis, present as biofilm. Antecedent viral infection in the upper respiratory tract triggers inflammation, increased mucus production and disturbance of the bacterial biofilm. The mucus aka "post-nasal drip" can facilitate translocation of the bacterial agents from the nasopharynx to the inner ear via the Eustachian tubes, which are anatomically more accessible in pediatric population compared to adults. Post-viral secondary bacterial infections, including otitismedia and sinusitis develop approximately 1 week after the viral infection.

2. **Correct Answer: A**
   **Rationale:** Great lakes area of midwestern USA and history of contact with (Areas where birds/bats roost, e.g. caves) makes Histoplasma capsulatum and histoplasmosis more likely as the etiologic agent and diagnosis respectively. Timeframe and relatively mild symptoms support a fungal etiology and make tuberculosis less likely (would expect night sweats, weight loss, bloody sputum). The PPD skin test is also non-reactive for someone from an non-endemic area, who is not immunocompromised. There is no evidence or reference to him being immunocompromised; he's not HIV positive therefore the diagnoses of Pneumocystis pneumonia (PCP) and Cryptococcosis or Cryptococcal meningitis are all less likely, as they are opportunistic pathogens. Aspergillosis is primarily opportunistic and can also be ruled out in the absence of any immunocompromise. That leaves mainly the primary fungal pathogens: Coccidioides and Histoplasma. Paracoccidioides isn't an option because there is no history of travel to south America. Blastomycosis could also be possible, but it isn't given as one of the answer choices.

3. **Correct Answer: A**
   **Rationale:** Mild symptomatology of the upper respiratory tract (both nose and throat) without involvement of other anatomical locations is highly indicative of the "Common Cold" aka rhinopharyngitis caused by viral agents including Rhinovirus. This is further supported by clear discharge (viral) and resolution with no complications. Adenovirus can cause both pharyngitis and conjunctivitis, which was not described in the vignette. Otitis media can be a complication and usually occurs 7-10 days after the primary viral infection.

4. **Correct Answer: E**
   **Rationale:** Tuberculosis is the top differential diagnosis of a cough lasting 3+ months in an elderly patient with past history of residing in a country endemic for Tuberculosis. Acid-fast staining is indicative of Mycobacterium tuberculosis, which is confirmed with the Interferon Gamma Release Assay. The lab findings are critical for differentiating between other possible causes, including fungal respiratory infections.

5. **Correct Answer: C**
   **Rationale:** The clinical presentation of chronic dry cough in elderly patient is more suggestive of Tuberculosis or Walking Pneumonia, which have overlapping symptomatology, likely ruling out Typical Pneumonia caused by Streptococcus pneumoniae or Pseudomonas aeruginosa. The microscopic findings are confirmatory for infection with Nocardia asteroides, which are weakly acid- fast branching, filamentous bacteria as seen in the image. Infection with Mycobacterium tuberculosis would show acid-fast bacilli arranged as serpentine cords. No bacteria would be visualized with Gram or Ziehl-Neelson staining for infection with Mycoplasma pneumoniae.

6. **Correct Answer: E**
   **Rationale:** The clinical presentation of insidious onset of dry cough in a college student is highly suggestive of Atypical "Walking" Pneumonia. The laboratory studies are consistent with Mycoplasma pneumoniae which is not visible with microscopy and triggers production of non-specific cross-reactive antibodies. M. pneumoniae lacks a cell wall and peptidoglycan thus this species of bacteria is intrinsically resistant to B-lactam penicillin class of drugs.

7. **Correct Answer: C**
   **Rationale:** Tuberculosis is the top differential diagnosis with a patient that has a cough that persists for > 4 weeks and history of recent travel to endemic country. The chest X-ray findings and positive PPD skin test are highly indicative of Primary Active Pulmonary Tuberculosis, which is confirmed with lab culture. The cell wall of Mycobacterium tuberculosis is composed of lipids, including mycolic acid and is responsible for slow growth, rich nutrient requirements, protection against desiccation, and staining pattern with acid-fast staining procedure. The mycolic acid in the form of cord factor (2 mycolic acid + trehalose) is a critical virulence factor to prevent fusion of the phagosomal compartment with the lysosome, thus facilitating growth inside macrophages. A = St. pneumoniae, Hib, Klebsiella; C = all Gram negatives, D = Mycoplasma pneumoniae; E = GI pathogens in DERS module

8. **Correct Answer: A**
   **Rationale:** The most common causes of Acute Exacerbated Chronic Bronchitis (form of typical pneumonia) are Strep. Pneumoniae, NT Haemophilus influenzae, Moraxella catarrhalis and Pseudomonas aeruginosa. Past hospitalizations is an increased risk of colonization with multi-drug resistant strains. The laboratory findings are indicative of Pseudomonas, which produces green pigment pyocyanin. B= Gram positive bacteria; C = Staph aureus; D = Mycobacterium tuberculosis;
   E = Bacillus anthracis.

9. **Correct Answer: D**
   **Rationale:** The patient is presenting with lower respiratory tract infection with SARS-CoV2, diagnosed as COVID-19 (the disease caused by SARS-CoV2). Diabetes is a high risk factor for more severe diseases and the genome indicates the infection is not with Influenza virus. The Spike protein binds to ACE2 receptor, present on many host tissues, thus resulting in broad tissue tropism of SARS-CoV2. A = Bordetella pertussis, Mycoplasma; B = Influenza and other respiratory viruses;
   C = Rhinovirus; E = HIV.

10. **Correct Answer: A**
    **Rationale:** The most common cause of lower respiratory tract infections in infants, including bronchiolitis, is Respiratory Syncytia Virus. All viruses in Paramyxoviridae family possess the F-protein (Fusion protein) which plays an important role for entry and uncoating of virion particle to host cell and is responsible for syncytia formation in the lung epithelium. B = L protein (Large Protein) is RNA Dependent RNA Polymerase found in most RNA viruses; C = HN protein (Hemagglutnin-Neuraminidase) is the viral attachment protein for Parainfluenza Virus PIV; D = VP capsid is structural component of Rhinovirus virion and viral attachment protein; E = Spike protein is viral attachment protein for SARS-CoV2.

11. **Correct Answer: E**
    **Rationale:** The most common cause of bacterial pharyngitis is Streptococcus pyogenes. The presence of purulent exudates (pus, neutrophils) is highly indicative of bacterial infection versus viral pharyngitis. Untreated infection with St. pyogenes can lead to excessive production of Anti-Strep antibodies that can cross-react with cardiac myocytes, triggering Acute Rheumatic Fever. If the initial infection is severe or the patient experiences repeat infection, the damage to the cardiac valves can become permanent, triggering Chronic Rhematic Disease. A = Encapsulated bacteria; B = Viral agents and atypical bacteria; C = Immunocompromised individuals including HIV-AIDS patients; D = SARS-CoV2.

12. **Correct Answer: D**
    **Rationale:** Patients with chronic lung disease, including COPD, commonly have chronic biofilm colonization with endogenous bacteria. The bacterial replication and infection leading to apparent disease can be triggered by a variety of factors, including viral upper respiratory infections. Persons with COPD have very high risk of developing Acute Exacerbated Chronic Bronchitis (AECB) which is a form of typical bacteria pneumonia, characterized by sudden worsening of cough and new onset of fever. Streptococcus pneumoniae is the most common endogenous colonizer and high risk patients are recommend frequent boosters with Pneumococcal vaccine containing components against 23 serotypes. A = only for military; Hib = infants to protect against epiglottitis and meningitis; D = infants to protect against Diphtheria, Whooping cough, and Tetanus with Tdap booster for adults; E = no vaccine available.

13. **Correct Answer: E**
    **Rationale:** Of all lung cancers, squamous cell carcinoma is most likely to produce paraneoplastic hypercalcemia, and there is a strong association with smoking. These tumors also can undergo central necrosis—hence a cavity may form. Localized squamous cell carcinomas, in contrast to small cell carcinomas, may be cured by surgery. Adenocarcinomas and large cell carcinomas tend to produce peripheral masses and generally are less likely to be associated with paraneoplastic syndromes. Renal cell carcinomas may be associated with hypercalcemia, but metastases usually appear as multiple masses. Small cell carcinomas are never localized enough for curative surgery (they are usually detected at an advanced stage), although they often produce various paraneoplastic syndromes, but less likely hypercalcemia.

14. **Correct Answer: B**
    **Rationale:** Goodpasture syndrome leads to renal and pulmonary lesions produced by an antibody directed against an antigen common to the basement membrane in glomerulus and alveolus. This leads to a type II hypersensitivity reaction. The anti–DNA topoisomerase I antibody is a marker for scleroderma. Antimitochondrial antibody is associated with primary biliary cirrhosis. C-ANCA and P-ANCA are best known as markers for various forms of systemic vasculitis. ANA is used as a general screening test for various autoimmune conditions, typically collagen vascular diseases such as systemic lupus erythematosus.

15. **Correct Answer: A**
    **Rationale:** Hypersensitivity pneumonitis has acute symptoms that occur soon after exposure to an antigen, often actinomycetes or fungi (molds) growing in contaminated ventilation systems (air conditioner or air ducts). The symptoms improve when the patient leaves the environment where the antigen is located. The pulmonary pathologic changes are usually minimal, with interstitial mononuclear infiltrates. It is mainly a type III hypersensitivity reaction, but with more chronic exposure to the antigen, there may be a component of type IV hypersensitivity with granulomatous inflammation and fibrosis. Attachment of antibody to basement membrane occurs in Goodpasture syndrome. Prostaglandins are produced by the cyclooxygenase pathway of arachidonic acid metabolism during acute inflammation, and they mediate pain and vasodilation. Histamine release is characteristic of a type I hypersensitivity reaction that more typically occurs in allergic disease. A toxic injury is more typical of inhalation of a toxic gas, such as sulfur dioxide (so-called silo filler's disease).

16. **Correct Answer: E**
    **Rationale:** He has a restrictive lung disease. Idiopathic pulmonary fibrosis (IPF) is a chronically progressive diffuse lung disease of unknown etiology. While the cause of IPF remains unknown, it appears that it arises in genetically predisposed individuals who are prone to aberrant repair of recurrent alveolar epithelial cell injuries caused by environmental exposures. Mutations in several genes involved in maintenance of telomeres underlie some cases. These allow fibroblasts to keep dividing. AAT deficiency and smoking lead to obstructive lung disease with emphysema. Cystic fibrosis leads to bronchiectasis. Congestive heart failure leads to pulmonary edema if left-sided and peripheral edema if right-sided.

17. **Correct Answer: A**
    **Rationale:** She has an uncommon form of restrictive lung disease. The patchy distribution of intra-alveolar plugs of loose organizing connective tissue are characteristic. Some patients recover spontaneously while most require treatment, usually with corticosteroids. Episodic hypersensitivity pneumonitis is marked by a type III response, and type IV when more chronic. Pulmonary hypertension affects mainly the pulmonary arterial vasculature. Pneumoconioses tend to produce fibrotic nodules, and asbestosis is often accompanied by pleural plaques. Sarcoidosis is a granulomatous disease often affecting multiple tissues.

18. **Correct Answer: E**
    **Rationale:** Explanation: Atopic asthma is a type I hypersensitivity reaction in which there are pre-sensitized, IgE-coated mast cells in mucosal surfaces and submucosa of airways. Contact with an allergen results in degranulation of the mast cells, with both immediate release (minutes) of mediators such as histamine to promote bronchoconstriction, and delayed release (an hour or more)of leukotrienes and prostaglandins via the arachidonic acid pathway; these attract leukocytes, particularly eosinophils, and promote bronchoconstriction. The characteristic histologic changes in the bronchi, including remodeling of airways and smooth muscle hyperplasia, result from the episodes of inflammation. Dilation of the respiratory bronchiole is a feature of centrilobular emphysema. Bronchial dilation with inflammatory destruction is a feature of bronchiectasis. Hyaline membranes are seen with acute diffuse alveolar damage. Neutrophilic exudates with consolidation are seen in pneumonic processes, typically from bacterial infections.

19. **Correct Answer: D**
    **Rationale:** The acute blood loss, in this case intraperitoneal hemorrhage, results in a reticulocytosis from marrow stimulation by anemia. Option A: Basophilic stippling of RBCs suggests an ineffective erythropoiesis or marrow injury, such as with a drug or toxin. Option B: Hypochromic RBCs occur in iron deficiency and thalassemias, both associated with reduced hemoglobin synthesis. Acute blood loss does not give rise to iron deficiency anemia if iron stores and diet are adequate. Option C: Leukoerythroblastosis is typical of a fibrotic process in the marrow, with both immature WBCs (myelocytes) and RBCs (nucleated forms) present. Option E: Schistocytes suggest a microangiopathic hemolytic anemia, which can accompany shock or sepsis

20. **Correct Answer: A**
    **Rationale:** This patient of Mediterranean descent has β-thalassemia major. In this condition, there is a severe reduction in the synthesis of β-globin chains without impairment of á-globin synthesis. The free, unpaired á-globin chains form aggregates that precipitate within normoblasts and cause them to undergo apoptosis. The death of RBC precursors in the bone marrow is called ineffective erythropoiesis. The severe anemia triggers erythropoietin synthesis, which expands the erythropoietic marrow. The marrow expansion encroaches on the bones, causing maxillofacial deformities. Extramedullary hematopoiesis causes hepatosplenomegaly. In comparison, the hemolytic anemia is mild in β-thalassemia minor, and there is very little ineffective erythropoiesis. Patients with chronic anemia may require RBC transfusions, which adds even more iron to body stores. Option B: is seen in hereditary spherocytosis due to membrane protein defects. Option C: is not a feature of chronic inherited anemias Option D: presents with macrocytic RBCs and low reticulocyte count. Option E: is seen in anemia of inflammation (anemia of chronic disease).

21. **Correct Answer: A**
    **Rationale:** Painful and acute enlarged nodes suggest a reactive condition and not a neoplastic process such as a lymphoma or a leukemia. In children, enlarged tender nodes and acute lymphadenitis are common. Many infectious processes can give rise to these findings, particularly bacterial infections. Children are “antigen sponges” when exposed to the usual minor infections; they are quite active and acquire plenty of cuts and scrapes on extremities, which can become infected, with reactive hyperplasia of regional nodes. Lymph nodes involved by lymphomas are usually painless. Option B: ALL is an immature B-cell neoplasm which effaces the normal architecture of lymph nodes with sheets of lymphoblasts. Option C: Follicular lymphomas are B-cell neoplasms that efface the normal architecture of the lymph nodes with nodules; these tumors do not occur in children. Option D: Sarcoidosis is a chronic granulomatous process typically seen in adults and characterized by the formation of noncaseating granulomas. Option E: Toxoplasmosis can be a congenital infection or can be seen in immunocompromised individuals; it produces a pattern of follicular hyperplasia.

22. **Correct Answer: C**
    **Rationale:** With RBC microcytosis, iron deficiency anemia must be considered. It could be a nutritional deficiency in children and pregnant women, but more likely is due to chronic blood loss in adults. The ferritin concentration is a better measure of storage iron because it is derived from the total body storage pool in the liver, spleen, and marrow. Option A: Bone marrow biopsy specimen provides a good indication of iron stores because the iron stain of the marrow shows hemosiderin in macrophages, but such a biopsy is an expensive and invasive procedure. Option B: Some patients with hemoglobinopathies, such as β-thalassemias, also can have a microcytic anemia, but this is far less common than iron deficiency. Option D: The serum haptoglobin level is decreased with intravascular hemolysis, but the anemia is normocytic because the iron can be recycled. Option E: The serum iron concentration or transferrin level by itself gives no indication of iron stores because in anemia of chronic inflammation, the patient's iron level can be normal to low, and the transferrin levels also can be normal to low, but iron stores are increased

23. **Correct Answer: B**
    **Rationale:** These findings are characteristic of a childhood acute lymphoblastic leukemia of the precursor–B-cell type. The rapid expansion of the marrow caused by proliferation of blasts can lead to bone pain and tenderness. Features supporting an acute leukemia are anemia, thrombocytopenia, and the presence of blasts in the peripheral blood and bone marrow. Anemia and thrombocytopenia result from suppression of normal hematopoiesis by the leukemic clone in the marrow. Option A: The phenotype of CD19+, CD3–is typical of pre–B cells and not T cells Option C: Acute myelogenous leukemia is a disease of young to middle- aged adults, and there would be peroxidase-positive myeloblasts and phenotypic features of myeloid cells. Option D: Chronic lymphocytic leukemia is a disease of older adults; patients have many small circulating mature B lymphocytes. Option E: Chronic myelogenous leukemia is a disease of adults, and the WBC count is quite high; the peripheral blood contains some myeloblasts, but other stages of myeloid differentiation also are detected.

24. **Correct Answer: A**
    **Rationale:** The presence of thrombocytopenia, increased prothrombin and partial thromboplastin times, and fibrin split products, as well as the low fibrinogen concentration, all suggest disseminated intravascular coagulation (DIC), which was most likely caused by a retained dead fetus. This obstetric complication can lead to DIC through release of thromboplastins from the fetus. The thromboplastins cause widespread microvascular thrombosis and consume clotting factors and platelets. Option B: There is no defect in platelet function (seen in vWD and Bernard Soulier syndrome) Option C: There is no damage to the vascular endothelium or vascular wall. Option D: Platelet production is normal, but platelets are consumed by widespread thrombosis of small vessels Option E: There are no autoantibodies (seen in ITP).

25. **Correct Answer: B**
    **Rationale:** The very high WBC count and the presence of peroxidase-positive blasts (myeloblasts) with Auer rods are characteristic of acute myelogenous leukemia (AML). This type of leukemia is most often seen in adults. Option A: Acute lymphoblastic leukemia occurs in children and young adults. Azurophilic, peroxidase-positive granules distinguish myeloblasts from lymphoblasts. Option C: Chronic lymphocytic leukemia is characterized by the presence of small, mature lymphocytes in the peripheral blood and bone marrow of older adults. Option D: Chronic myelogenous leukemia also is seen in adults, but this is a myeloproliferative process with a range of myeloid differentiation, and most of the myeloid cells are mature, with few blasts. Option E: Hodgkin lymphoma does not have a leukemic phase.

26. **Correct Answer: B**
    **Rationale:** Tumor Lysis Syndrome is an oncologic emergency that occurs secondary to the rapid cell death that follows the administration of chemotherapy mainly in patients with leukemia or lymphoma. Manifestations include hyperuricemia, hyperkalemia, hyperphosphatemia, and secondary hypocalcemia. Uric acid and calcium phosphate crystals may deposit in the kidney and lead to renal failure. The primary management strategy is prevention with intravenous hydration with normal saline, and allopurinol or rasburicase.

27. **Correct Answer: A**
    **Rationale:** Chemotherapy with cisplatin is associated with severe nausea and vomiting. A 5HT3 antagonist is administered for control of chemotherapy-induced emesis.

28. **Correct Answer: E**
    **Rationale:** Chemotherapy with vincristine is associated with peripheral neuropathy.

29. **Correct Answer: B**
    **Rationale:** Hydroxyurea: It has become the standard agent for prophylaxis against painful crisis in moderate to severe sickle cell disease. It has been demonstrated to reduce hospitalization in these patients. The major toxicities are leukopenia, the induction of megaloblastic changes, maculopapular skin rash and painful leg ulcers.

30. **Correct Answer: C**
    **Rationale:** The patient's history and lab results indicate that he is suffering from iron deficiency anemia due to GI blood loss. In this case, the loss was caused by ibuprofen therapy. The prevalence of endoscopically confirmed gastrointestinal ulcers in nonsteroidal anti-inflammatory drug users is 15 to 30%. Iron is the standard therapy for iron deficiency anemia, and it acts only by replacing the severely depleted stores. Treatment with oral iron should continue for 3-6 months after correction of the cause of iron loss in order to fully replenish iron stores. Ascorbic acid (Vitamin C) should be co-administered to provide a mildly acidic gastrointestinal medium for optimal absorption.

31. **Correct Answer: D**
    **Rationale:** Visual acuity test and red-green discrimination (Ishihara test), Adverse effects of ethambutol Liver function tests are done as baseline tests before starting the quadruple treatment for TB. Hepatotoxicity possible with rifampin, isoniazid and pyrazinamide use.

32. **Correct Answer: E**
    **Rationale:** The patient has multibacillary form of leprosy, which is treated with three drugs- dapsone, rifampin and clofazimine.

33. **Correct Answer: C**
    **Rationale**: The patient is started on a RIPE treatment. Mechanisms of resistance Rifampin: point mutations in rpoB Ethambutol: mutations (usually over expression) in the Emb gene Pyrazinamide: mutations in pncA Streptomycin: mutations in gene encoding ribosomal protein S12 Isoniazid: KatG.

34. **Correct Answer: B**
    **Rationale:** Ipratropium provides additive benefit to SABAs in the management of moderate to severe exacerbations of asthma.

35. **Correct Answer: A**
    **Rationale:** The management of asthma exacerbations includes; Inhaled short-acting beta 2-adrenergic agonists (SABAs). Inhaled short-acting muscarinic antagonists (SAMAs). Systemic corticosteroids.